A FAWCETT PUBLICATION

MODERN MECHANIX AND INVENTIONS

NOV. 25c
IN CANADA 30c

SEE PAGE 39

HOW FRANK BUCK FILMED HIS FAMOUS TIGER-PYTHON BATTLE

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Suction Cell Retainer is the newest invention for rupture. No bulk, no slipping. Holds and lets Nature heal.

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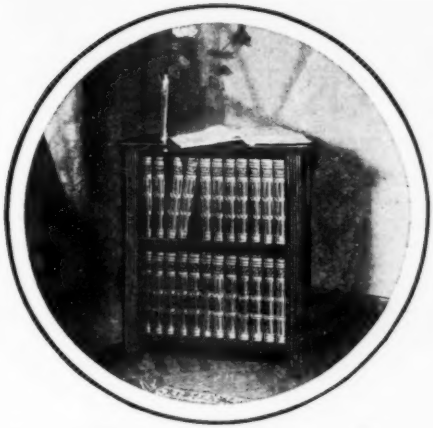

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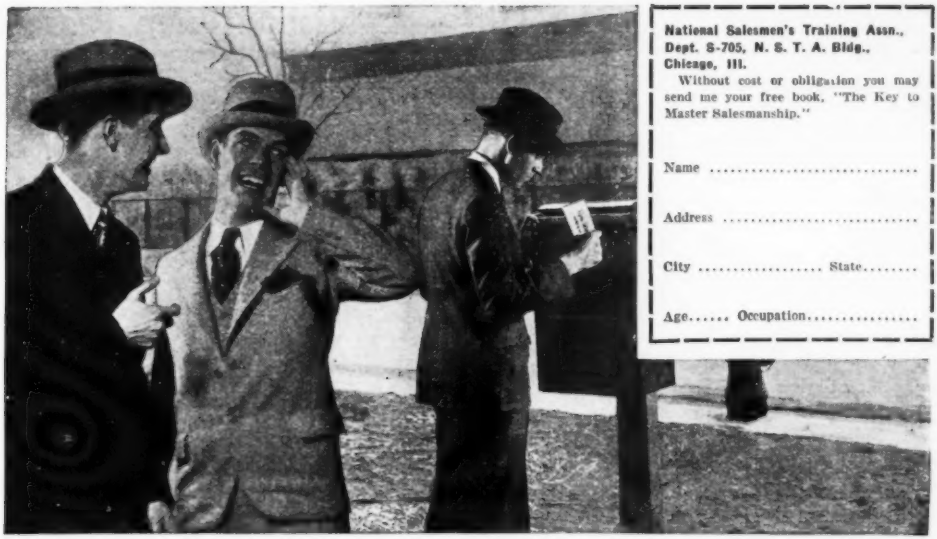

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They both laughed uproariously. And probably it did seem like a joke to them that a $30 a week clerk would have the nerve to think he could ever get anywhere or make real money without some special "gift" or "pull."

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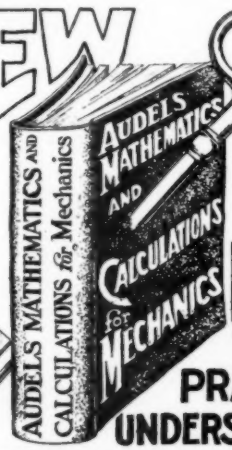

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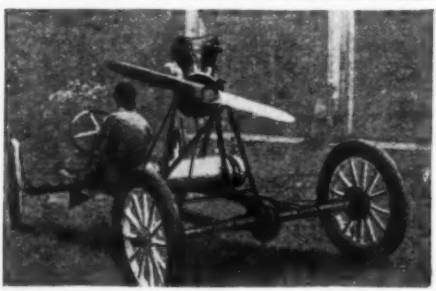
WAL, boys, with times so tough that even a skunk can't make a scent it looks like we've all got plenty of time for building those brain-waves each of us has stored in his cranium during busier days.

My mail proves it. More and more I get pix showing that not only have M-M & I readers been building things that are a credit to themselves and to us, but that these self-same gents know how to use a camera and are sufficiently endowed with a news sense to use it and send us the results.



Warren Wheeler, of East Bloomfield, N. Y., built this wind wagon, using an old Indian for a pusher. No thrust bearing was needed or used and she sure does travel!

Take the case of diving helmets—an awfully popular subject to all readers, seemingly, at all times. I have this last week received pictures of eight different diving helmets from eight different sections of the country which contained the pictured records of the use of these things. One of the best pix was from Milton Johnson, whose letter will prove highly interesting. It records his experiences with a helmet similar to the one recently run in Modern Mechanix and Inventions. The letter:

Dear Andy,

You will find enclosed a picture of our diving equipment which is entirely original in construction, showing new features which may interest you and the M. M. & I. fans. The picture shows Clarence Smith coming up, after spending twenty minutes in thirty feet of water. Stanley and Bob Widger are removing the helmet and I am tending the telephone and engine.

A gasoline engine and an air compressor supplies enough air for a maximum working depth of fifty feet. This method of air supply is very dependable and saves a great deal of work. If the engine should stop and could not be restarted while the diver is in the water, an incident which so far has never occurred in

(Continued on page 14)

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—*because Accountants Command Business*

ACCOUNTANTS have been in demand—at far better than average earnings.

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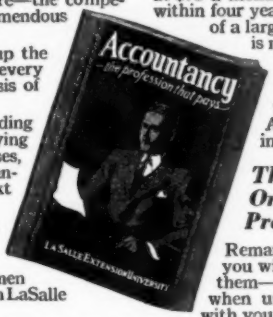

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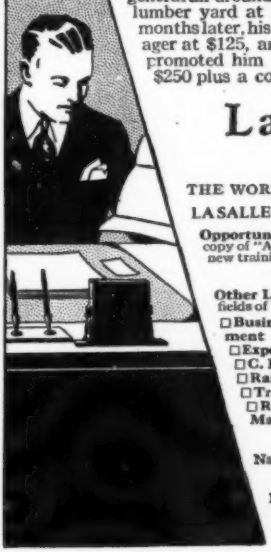

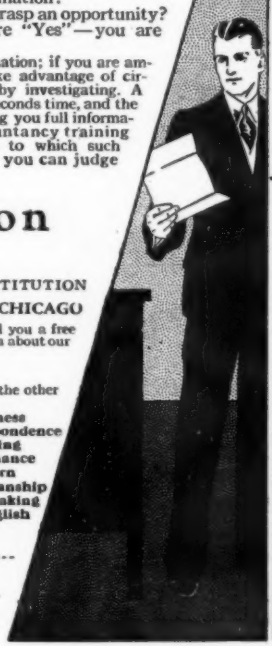

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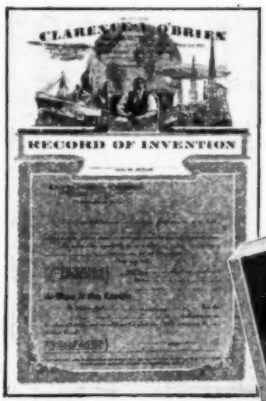

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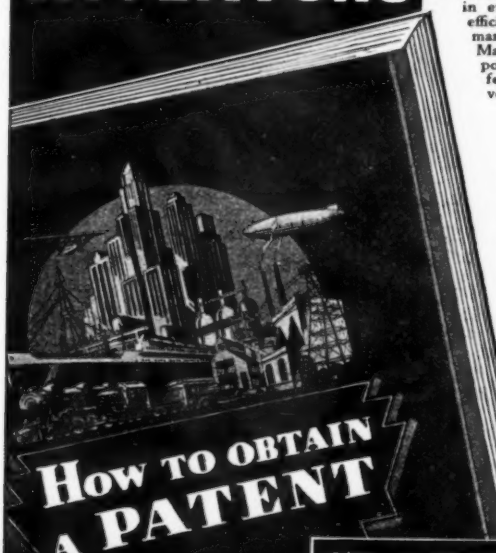
TENTS

FOR... INVENTORS



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ANDY'S SHOP MAIL BOX

(Continued from page 10)

Donald Newton's brother and Donald himself in the tin hat built this diving helmet. They used a boiler, celluloid, a tire valve and a bike pump. It works satisfactorily!

our diving experience, enough air is carried in reserve to insure safety until he is brought to the surface. A pressure gauge is connected in the air line and is used to determine the depth at which the diver is working; four and one-half pounds of air is required for every ten feet.

The helmet was made from a hot water boiler and, as you will notice, is larger than the helmets pictured several times in your section of the M. M. & I. Although more weight is required, we find that the larger helmet is more comfortable. Rubber aprons are used around the openings cut for the shoulders. When the exhaust valve is closed on the helmet, the air forces the water below these aprons, increasing the buoyancy of the helmet and allowing the diver to shoot himself to the surface without aid from above. The helmet with one set of lead weights weighs one hundred twenty-five pounds in air and with the other set it weighs twenty-five pounds more. However, both sets of weights are used together only when working in very rough water. The weights are so placed on the helmet that in testing, it was practically impossible for the helmet to capsize.

The telephone equipment consists of three wire rubber covered cables and an airplane interphone outfit. Two way communication is carried on with diver and is the greatest factor in insuring his safety.

Our next addition to the equipment will be a water-proof suit.

Our interest in diving was at first a hobby, but we have since then commercialized this hobby making it a financial success. Our first

(Continued on page 16)

[15 to 550 Meters]

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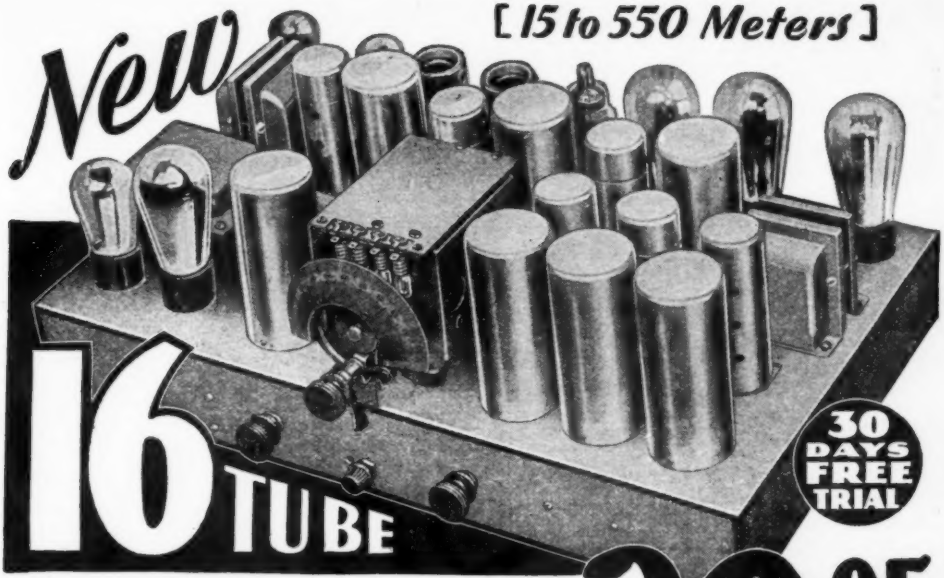

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Read this letter!

"During the past week I logged the following: FYA Pontoise, France; GBK Rugby, England; HVJ Vatican City, Italy; XDA Mexico City; VK-2ME Sydney, Australia; VE9GW Bowmanville, Canada; 12RO, Rome, Italy; G6SW Chelmsford, England; CGA and VE9DR Drummondville, Canada. Also picked up many amateur and airport stations from all over United States. Numerous ship, shore and trans-Atlantic phones from both sides and an Hawaiian Test Station came in clear and sharp. Several Spanish and German speaking stations have also been received but not yet identified. Have received every broadcast from FYA, morning and afternoon, for over a week with wonderful tone and volume. The Midwest set is certainly one to be proud of."—Wm. S.Teter, Winterpark, Florida.

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Name..... Age.....

St. No.....

City..... State.....

ANDY'S SHOP MAIL BOX

(Continued from page 14)

job which required only ten minutes of actual diving in raising a new three hundred fifty dollar outboard engine, netted us an amount which was more than enough to pay for the entire equipment. Free advertisement was received in a news report with a picture of our equipment in a paper of wide circulation throughout the lake region of Central New York.

MILTON JOHNSON
15 North Church St.
Cortland, N. Y.

Two things are remarkable in that letter, for which I thankee, Milton. One, boys, is the little note about 4½ lbs. gauge pressure being required for every 10 feet of water worked in. This I take it is not to keep the operator comfortable, but to keep the water out of the bottom of the helmet.

The other thing remarkable is that the ownership of one of these riggin's pays well. Hedeen Jackson of Excelsior, Minn., mentions also in his letter of making $110 in recovering three outboard motors in weedy waters where dragging couldn't be of any use. His usual fee is one-third the retail value of the motor, which is what the job is worth when you consider the risk to life, limb, and discomfort down among the ickey.

Here's another letter on the same subject from down in Hondo, Texas, which, thanks to air mail, is just as good as across the street.

Hondo, Texas

Dear Andy,

I am sending you some snaps of a diving helmet I made at the total cost of $1.20 out of which I paid the 20c and furnished the material. The helmet is made from an old water heater, for weight I use a cog wheel made for a cameron packer, part of a cotton gin, which I place over the hose connection on the top of the helmet to increase the ease of removing the helmet under water in case it is necessary. I had to bail out once on account of a lazy man at the pumps. There are three of us in cahoots with the thing. The pumps are made from the motor of an old Excelsior motorcycle. The cylinders, pistons and intake valves are all I could find after three or four other guys got through playing with the said motor. At the first trial the pumps didn't work but when I finally got the idea of putting one-half inch pipe and fittings in place of the valve box with leather flap valves the thing worked. I have changed the pumps to a horizontal position now and get much more air, in fact so much that I once blew the helmet off of the head of one fellow who kept yelling for more air.

The two valves with the air space in between do not work so good so I use one valve. I would like to get in touch with any of the boys with these dinkuses so we could discuss our problems.

Tell your boss he prints a great mag.

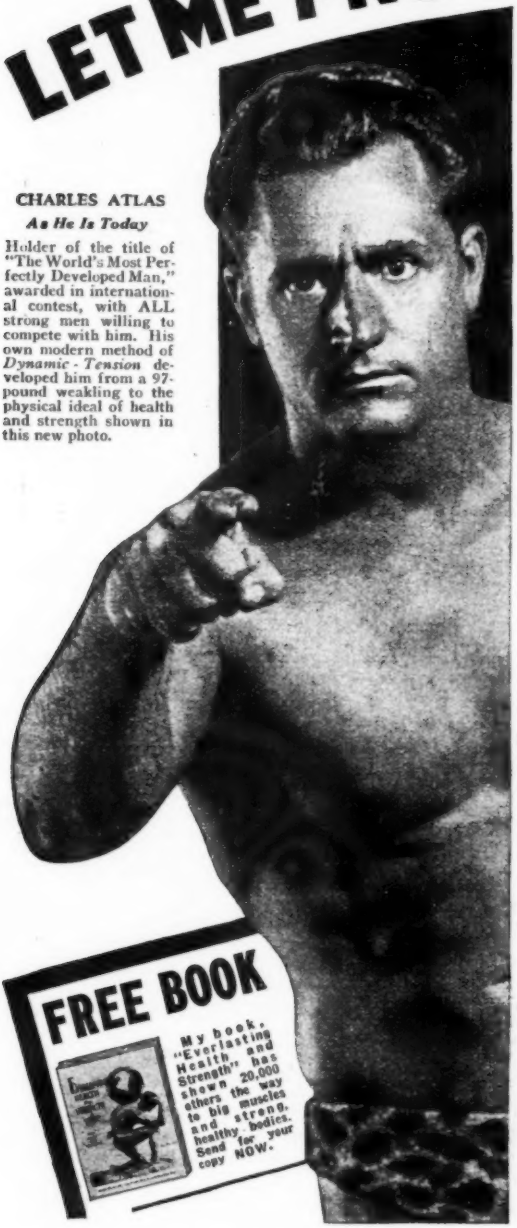
Yours truly,
JAMES CROW

Now, I didn't read your letter through, Jim, on account of the crow tracks being so thick I thought

(Continued on page 18)

LET ME PROVE IN 7 DAYS

that I can make YOU a NEW MAN!



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Just jot down your name and address on the coupon below, mail it to me—and I'll send you, absolutely free, a copy of my new book, *"Everlasting Health and Strength."* It reveals the secrets that turned me from a 97 pound, flat-chested weakling into a husky fellow who won the title of "The World's Most Perfectly Developed Man" against all comers! And it shows how I can build *you* into an "Atlas Champion" the same easy way.

It tells the fascinating story of how I've taken underdeveloped, flabby, no-muscle men of all ages and given them big powerful muscles, increased measurements all over, amazing strength, endurance, vitality and pep—all in a few minutes of spare time daily at home.

Thousands of fellows all over the world have used my methods—and now *you can too.* Like them, you can put on firm layers of muscle where you need it most, tone up your whole system, banish constipation, poor digestion, bad breath, pimples and other conditions that rob you of the good things and good times of life, and get the "drive" that'll take you to the top of the ladder.

It's Easy My Way

I haven't any use for apparatus that may strain your heart and other vital organs. I don't dose you or doctor you. *Dynamic-Tension* is all I need. It's the *natural,* tested method for developing real men inside and out. It distributes added pounds of powerful muscles over your body, gets rid of ailments and surplus fat, and gives you the vitality, strength and pep that win you the admiration of every woman and the respect of any man.

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Contains all the newest automotive developments, clearly and fully explained
Engine Principles
Four Wheel Brakes
Front Wheel Drive
Synchro-Mesh
Straight Eights
Free Wheeling

Free Examination

These books are sent to you without any obligation. You may keep them for full 10 days. Look them over, find out any facts you want to know, prove to your own satisfaction how valuable they can be.

These books have been fully revised and meet every need of the automobile owner or expert.

SEND NO MONEY NOW

All we want you to do before we ship the complete set is to give us your name and address. Just send the coupon and we will ship immediately. On delivery you deposit only $2, plus the few cents delivery charges. Then keep the books for full 10 days before you decide whether or not you want them. You will immediately recognize the advantages of the Jiffy Index, which puts facts at your finger tips instantly. If you decide to keep them send $3 in 30 days and $3 a month until the special low price of only $24.80 is paid. There is nothing more to pay and no other obligation of any kind.

Note: Of course, if you prefer, you may enclose $2 with the coupon, and the books will be sent to you with the same guarantee and the same promise of an immediate refund.

American Technical Society, Dept. A-8320, Drexel Ave. at 58th St., Chicago.

You may send me the 6 big money-making books on automobile engineering, latest edition, with the understanding that I will deposit $2 on delivery, which deposit is to be immediately returned to me if I return the books within 10 days, at your expense. If I decide to keep them, I will send you $3 in 30 days and then $3 a month until the special low price of only $24.80 is paid. Note: If you are enclosing $2 please check here...

Name .....

Address .....

City ..... State.....

ANDY'S SHOP MAIL BOX

(Continued from page 16)

C. R. Lewis proves that he can fly a glider by taking his own picture while aloft in his Alexander glider, club owned in Indiana. A box camera did the trick.

I'd let the linotype setter wiggle through it, but I'll read it when proofs of my col. come to me and if there is anything in it that shouldn't be I'll have to foot the bill for alterations. Your pix were so small I couldn't run 'em. Sorry.

Well, glub, glub. We've been diving.

How about a little thrill in the air? Lookee at the picture of C. R. Lewis, taking his own picture while he is actually up in the air on a glider. I present this as the most novel photo you hangar hounds has sent me this month.

Lews' letter:

813 Division St.
Laporte, Ind.

Dear Andy:

I'm enclosing some snaps we made of our glider in the air by fastening the camera to one of the wing skids.

This glider is an Alexander trainer with an enclosed fuselage we built on. The enclosure added 13 pounds to the total weight which isn't bad, is it?

If you pass this on to the gang in M. M. they can get any info they want by writing me.

Yours,

C. R. LEWIS

There's an invite! If you want to swap glider experiences with Lewis, jes write the man at his home address.

What we said about boats and boat clubs in issue before last has sunk home with a bang.

(Continued on page 20)

DRAW ME

COMPETE FOR AN ART SCHOLARSHIP

RULES FOR CONTESTANTS

This contest open only to amateurs, 16 years old or more. Professional commercial artists and Federal students are not eligible.

NOTE THESE RULES CAREFULLY

1. Make your drawing of girl 4½ inches high, on paper 5 inches wide by 6½ inches high. Draw only the girl and not the lettering nor border.
2. Use only pencil or pen.
3. No drawings will be returned.
4. Write your name, address, age and occupation on the back of your drawing.
5. All drawings must be received in Minneapolis by October 25th, 1932. Prizes will be awarded for drawings best in proportion and neatness by Faculty members of the Federal Schools, Inc.

Copy this girl's head and send us your drawing—perhaps you'll win A COMPLETE FEDERAL COURSE FREE! This contest is for amateurs (16 years of age or more), so if you like to draw do not hesitate to enter. Prize Awards made by the Federal Schools, Inc., will be accepted as partial payments on the regular Federal Course in Commercial Designing or Modern Illustrating.

PRIZES

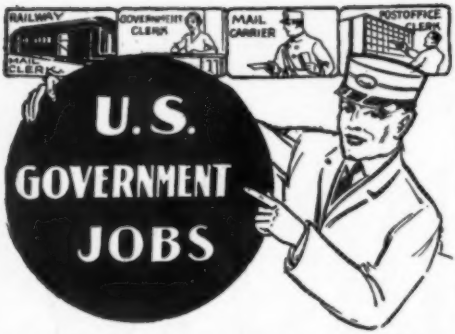
1. **Prizes for Five Best Drawings—FIVE COMPLETE ART COURSES FREE, including drawing outfit. (Value of each course $185.00.)**
2. **All Contestants grading 70% or over will be awarded a $35.00 credit.**

No Art Scholarships will be awarded to drawings graded less than 70%, as the Federal Faculty feels the study of Commercial Art would not be justified in such cases.

The quality of instruction in the Federal Course develops your natural talent to a practical earning ability in the shortest possible time. It has been the start for many Federal Students, both men and girls, who are now commercial artists and illustrators, earning $2,000, $4,000, $5,000 and $6,000 yearly—some even more. The Federal Schools has won a reputation as the "School famous for successful students". Enter this contest . . . a splendid chance to test your natural talent. Read the rules carefully and send your drawing to

FEDERAL SCHOOLS, INC.

1124-B FEDERAL SCHOOLS BLDG. MINNEAPOLIS, MINN.



$1260 to $3400 a Year

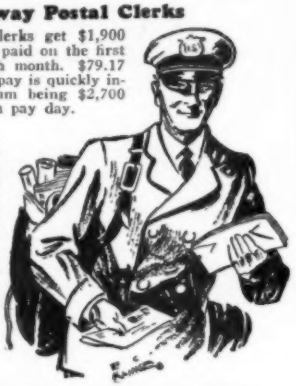
PICK YOUR JOB

Men, Boys—18 to 50

Prepare now for thousands of positions to be filled following the depression.

Railway Postal Clerks

Railway Postal Clerks get $1,900 the first year, being paid on the first and fifteenth of each month. $79.17 each pay day. Their pay is quickly increased, the maximum being $2,700 a year. $112.50 each pay day.



On long runs, Railway Postal Clerks usually work 3 days and have 3 days off duty or in the same proportion. During this off duty their pay continues just as though they were working. They travel on a pass when on business and see the country. When they grow old, they are retired with a pension.

City Mail Carriers, Post Office Clerks

Clerks and Carriers now commence at $1,700 a year and automatically increase $100 a year to $2,100 and $2,300.

Customs and Immigrant Inspector

Salary $2,100 to $3,300. Men 21 to 45. Work connected with examining immigrants and merchandise entering the country from foreign ports.

You Can Get Them

Experience is usually unnecessary and political influence is not permitted. Let us show you how.

Get Free List of Positions

Fill out the following coupon. Tear it off and mail it today—now, at once.

This investment of three cents for a postage stamp may result in your getting a government job.

FRANKLIN INSTITUTE, Dept. B-315, Rochester, N. Y.

Rush to me entirely free of charge (1) a full description of the position checked below: (2) Free Copy of 32-page book, "How to Get a U. S. Government Job"; (3) A list of the U. S. Government Jobs; (4) Tell me how to get a Government Job.

- ☐ Railway Postal Clerk ..... ($1,900-$2,700)
- ☐ Post Office Clerk ..... ($1,700-$2,300)
- ☐ City Mail Carrier ..... ($1,700-$2,100)
- ☐ Rural Mail Carrier ..... ($2,100-$3,400)
- ☐ Government Clerk—File Clerk ..... ($1,260-$2,500)
- ☐ Inspector of Customs ..... ($2,100-$3,300)
- ☐ Immigrant Inspector ..... ($2,100-$3,000)

(This year, 1 month off without pay)

Name .....

Address .....

Use This Coupon Before You Mislay It

ANDY'S SHOP MAIL BOX

(Continued from page 18)

More letters than I can print, more's the pity, have come in offering suggestions about this or that, and the final outcome is that everybody wants a cruiser a little bigger than the ones we are offering in our free booklet on published plans. And saa-ay, if you haven't one of these free booklets, just address Kate McKeon, care of this mag, 529 So. 7th St., Minneapolis, Minn., and say, "Kate, old dear, will you send me one of those swell little picture books which shows all of the blueprints I can get for boat building?"

Kate is a fast gal and will shoot you the booklets so quick it'll make your head ache—but what I wanted to say was, we have plans on the make for a fine little cruiser and for a fine big one. These seaboard readers want their boats big and husky—the river boys like 'em little and cute. So there you are. Keep a weather eye peeled.

* * *

One thing I'll have to do about this next thought and that is refer you to Glen Walton's ad on page 22 which shows his interesting little boat going great guns with a Star 4.

Walton writes us that the little wagon is simple as ABC to build, and that with any good souped up little auto engine she'll make a great rig for getting from one place to the other in a hurry.

We believe him. Any boat that can carry five people at 25 miles an hour and which will take the remaining miles out of an auto motor is sure to be popular. Good luck to you Glen, and let us know how the boys come out who build her, will ye?

* * *

This wind wagon idea is another perennial which seems to appeal to the imagination. Don't for five minutes get the notion that I'm agin 'em, as I ain't. But bein' a practical cuss I can't get

(Continued on page 22)

Learn to Dance

You can learn all the modern dances—the latest Tango steps, the new Fox Trots, dreamy Waltzes, smart Collegiate Steps, and popular Society Steps at home, easily and quickly. New chart method makes dancing as simple as A-B-C. No music or partner required. Don't be a wallflower. Learn to dance. Complete course—256 pages, 64 illustrations, sent on 5 Days' Free Trial. Equals $20.00 course. Send no money. Pay postman only $1.98, plus postage upon arrival. Money back if not delighted. Catalog Free.

Franklin Pub. Co., 800 No. Clark St., Dept. A-315, Chicago

Photography for PLEASURE or PROFIT

A fascinating hobby or a profitable business can now be yours. Prepare quickly at home under the personal guidance of leading experts in the fine art of photography. No experience necessary. Full or spare time. Many earn while learning. Our thorough studio method also qualifies you to fill a well paying position upon graduation. Send coupon now for FREE booklet, *Opportunities in Modern Photography.*

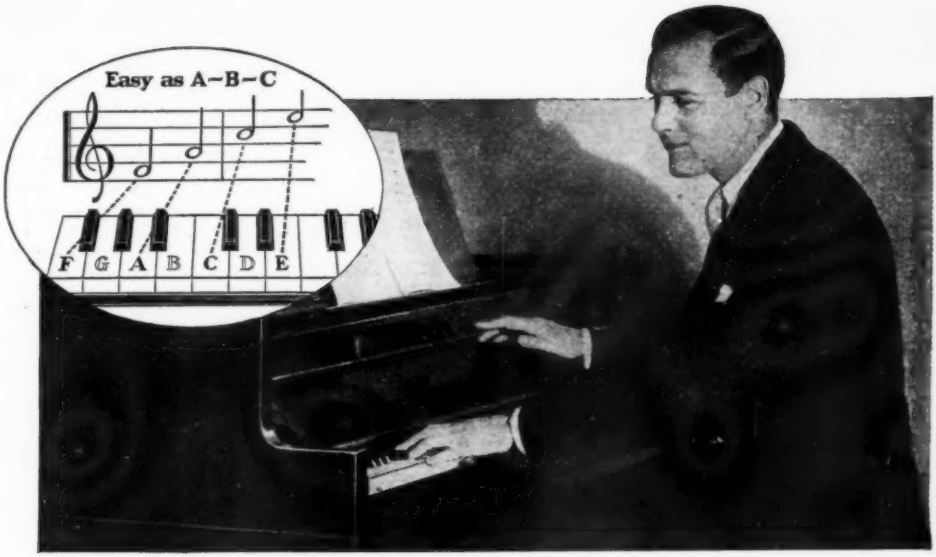
AMERICAN SCHOOL OF PHOTOGRAPHY
3601 Michigan Avenue Dept. 2058 Chicago, Ill.

Send FREE booklet, *Opportunities in Modern Photography*, and full information.

Name .....

Address .....

City ..... State .....



Too Old to Learn Music?

Hardly. Not after thousands of men and women between the ages of 30 and 50 have enrolled with the famous U. S. School of Music and have learned to play their favorite instruments without the slightest difficulty or waste of time!

WHAT has your age got to do with learning music when you now have a method at your disposal that has done away with compulsory practice—tabooed monotonous scales—that has slashed expensive fees—that makes *you* the boss instead of requiring a personal teacher?

If hundreds of children, scarcely in their "teens," learn to read notes and play a musical instrument with only our printed instructions and illustrated diagrams, think how simple it must be for older people to follow, benefit, and progress rapidly in this home-study manner.

Always Fascinating

You'll never lose patience. You'll *want* to study—you'll actually look forward to the "next lesson" when you study music the U. S. School way.

And no wonder. You spend a little time each day in your own home hearing your musical dreams come true. There's no personal teacher—no intricate explanations to baffle you — no trust-to-luck tactics. For right with you at all times are our concise print and picture instructions keeping you on the right track—telling you what to play and showing you how to play it. Each new lesson contains a new thrill. For the entire course from the very beginning to the end is brimful of cheerful, tuneful selections which you eagerly learn to play *by note*.

And, regardless of what instrument you select, the cost of learning will average only a few cents a day.

Music Will Be An Unfailing Friend

The older you get, the more you need the solace and pleasure that self-made music affords. Anyone can tune in on a radio—play a record or get music out of a player piano. But what empty satisfaction compared to making music *yourself!*

The ability to play offers you a definite escape from monotony—gives you the opportunity to do something real—to meet people—to make friends. And there's nothing like good music to help you forget your troubles.

Every child, too, who can play a musical instrument enjoys an accomplishment that attracts, entertains and holds chums — that replaces bashfulness with confidence and poise — that assures a social and profitable "standby" for their later years.

Think of the satisfaction of being able to play what and when you want. Forget your age. And bear in mind, you don't have to know one note from another to start your lessons from the U. S. School of Music.

Pick Your Instrument

Piano	Violin
Organ	Clarinet
Ukulele	Flute
Cornet	Saxophone
Trombone	Harp
Piccolo	Mandolin
Guitar	'Cello

Hawaiian Steel Guitar
Sight Singing
Voice and Speech Culture
Harmony and Composition
Drums and Traps
Automatic Finger Control
Banjo (Plectrum, 5-String or Tenor)
Piano Accordion
Italian and German Accordion
Juniors' Piano Course

Write Us First

Are you sincerely interested enough in music to want to find out all about this easy as A-B-C method of learning? Then send at once for our free 64-page booklet, "Music Lessons in Your Own Home," explaining this famous method in detail. With it will be sent a Free Demonstration Lesson, which *proves* how delightfully quick and easy — how *thorough*—this modern method is.

If you really want to learn to play—without a teacher—in one-half the usual time—and at one-third the usual cost—send for the Free Booklet and Free Demonstration Lesson TODAY. No obligation. (Instrument supplied if desired—cash or credit.)

U. S. School of Music, 26211 Brunswick Bldg., New York City.

Thirty-fourth Year (Established 1898)

U. S. SCHOOL OF MUSIC,
26211 Brunswick Bldg., New York City.

Please send me your free book, "How You Can Master Music in Your Own Home," with Inspiring message by Dr. Frank Crane, Free Demonstration Lesson, and particulars of your easy payment plan. I am interested in the following course:

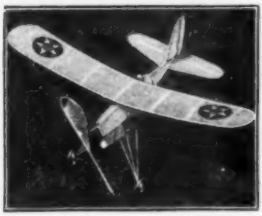
Have You
.....Instrument? ....

Name .....

Address .....

City ..... State.....

FREE FLIES 900 FEET!



Big Sling-Shot Glider FREE with each "build-it" plane-kit! Loops, stunts! Fun galore! Read important news below! Order! Quick!

Dipper EASY to BUILD

Weighs ½oz.—Flies 900 Ft.!

Amazing Dipper rises off ground, costs only 50c prepaid! Thousands built, flown! YOU GET ALL THIS mailed in big, yellow box including Free Glider: Jap tissue, balsa "prop" blank, wheels, bamboo, balsa ribs and formers, insignia, cement, banana oil, wire parts, rubber motor, FULL-size 3-view plan, clear instructions. Order Quick!

Prepaid **50c**

QUICK! Get AMAZING New CATALOG PRINTED in 5 COLORS — Just Out!

Comet's new 24-page 5-color Catalog is most amazing plane catalog in world!! EACH PLANE shown in FULL, bright, beautiful colors! Supplies pictured! Different! Unique! Startling! LIMITED SUPPLY ONLY SO ORDER QUICK! FREE with order, or sent anywhere for 5c. Worth 25c! It astounds, delights everybody! ACT! Get NEW Catalog thrill! O BOY!

FREE

Strange NEW Celluloid Propeller INVENTION Banishes "Prop" Carving---FREE with Baby Bullet and Navy Racer kits! FREE Super-pulling, realistic, already formed Bates Celluloid Propeller is sensational! Gives BETTER Flights—outlasts planel Eliminates propeller carving job! (See photo). Free with shaft on $1 and $1.50 kits. Prices ordered separately: 5" 12c-6" 15c, 7" 18c ea. Colors: Red, green, yellow, chalk-white! Order quick!

"My FLYing SCALE HOWARD RACER AVERAGES 750 FT.!"

So writes J. Etherington! Many fly it farther! This great flying scale is EASY to build, looks real—COST ONLY 75c prepaid! COMPLETE "build-it" kit in big, yellow box with Free Glider has EVERYTHING needed to build, fly! Order Now! Get FREE Catalog! Hurry!

75c Prepaid

New! Heath Baby Bullet FLYing Scale!

FIRST FLYing scale of Bullet selling for $1 prepaid! Colored orange, blue! EASI-LY BUILT — realistic — a flyin' fool! COMPLETE KIT has ALL MATERIAL, plans, etc., to build, fly! In big, colored box with Free Glider and Catalog! QUICK! Order!

$1.00 Prepaid Span, 14 in. 1-2 Long 13 in.

Span, 13" 14" Long

$1.50 Prepaid

NEW, Fast U. S. NAVY RACER FLYing SCALE! Red, white, blue! Costs only $1.50 prepaid, very EASY to build. FLIES! Hand-launched for land flights, or rises off water! COMPLETE KIT with Free Glider and Catalog in beautiful silver, red and blue box! BIG BARGAIN! ACT!

SPECIAL: 3 KITS each in Big Colored Box, Prepaid $2

For limited time only you can get GROUP 1 (Dipper, Howard Racer, Baby Bullet) for only $2 prepaid! GROUP 2 (Navy Racer, Howard Racer) for only $2 prepaid! World's wonder Catalog in 5 Colors FREE with order, or send 5c! SATISFACTION GUARANTEED OR MONEY REFUNDED! We pay postage on ALL CASH orders! Send money order. If check, add 15c extra. Canadians send 15c more per kit, 30c more per Group! We trust you! Send no money—just mark, send convenient coupon NOW! Remember, FREE Bates Celluloid Prop with Navy Racer and Heath Bullet kits! HURRY! ACT QUICK! ORDER NOW! Dealers WRITE!

SEND NO MONEY MAIL COUPON NOW!

"ACT NOW"

COMET

Comet Model Airplane & Supply Co.
3114 Harrison, Dept. MM-112, Chicago.

Send me, "Satisfaction Guaranteed" articles I am checking. Group No. 1 ( ), Group No. 2 ( ), Catalog 5c ( ), Dipper ( ), Howard Racer ( ), Navy Racer ( ), Heath Bullet ( ), Celluloid "Props", Size..... Number..... Color..... ( ) Send articles C.O.D. I'll pay postage, C.O.D. fee. ( ) I enclose $..... for articles. Comet pays postage!

PRINT Your NAME, ADDRESS BELOW HERE!

ANDY'S SHOP MAIL BOX

(Continued from page 20)

much concerned about the mighty thunder involved in getting nowhere in one of these things.

Here's a word on the subject, with a picture from Warren Wheeler.

East Bloomfield, N. Y.

Dear Andy:

I have read M-M some time now and enjoy the Mail Box more than any other feature.

I have wondered many times why someone did not send in a description of a wind wagon. I gave up hope of ever getting any info so started in myself to make one. As I had an old Indian twin cycle, 1917 vintage, and a garage junk pile at my disposal I concocted the vehicle as shown in picture. The motor is mounted on angle iron about three feet above the frame of an old model T. As you will see no springs are used. But the thrill of riding under propellor power at from forty to fifty miles an hour makes one forget any bumps. Originally a front wheel assembly was used in back and greater speed was obtained than with a regular rear end assembly. But the country is hilly around here and brakes were found better than shoe leather in stopping. A four and a half foot prop proved more satisfactory than a four footer. This arrangement will carry one person up any of our hills and two people up most of them. Although not fast

(Continued on page 26)

30 M P H SPEED BOAT

BUILD IT YOURSELF COMPLETE $75.00

An Inboard Hydroplane Runabout using a Star 4 or Model A Ford Motor. Length, 16 ft. Beam, 5 ft. A very serviceable and economical 5 pass. Boat for either Ocean or River use. Fine for troll fishing with the added feature of a Speedy Hydroplane. A FREE Large photo sent on request. Send at Once for COMPLETE PLANS AND SPECIFICATIONS, $2.00. WALTON BOAT WORKS, 937 N. Sycamore Ave., Los Angeles, Calif.

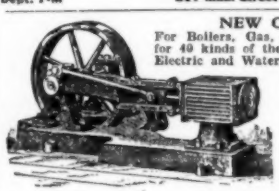
ILLINOIS MAN MAKES $88 in one Week

Pennsylvania agent cleared $76 in 4 days. Texas live wire started with earnings of $144. Profits like these easy for you with amazing new invention—just out.

Pants Pressed in 10 Seconds by ELECTRICITY.

Millions waiting for this wonderful RED LION ELECTRIC Trouser Presser. Puts razor edge creases in pants by electricity. As easy to use as a clothes brush. Only presser in the world that will crease pants while being worn. Will last years. Sample fits in pocket. Take orders. 100 per cent profits. Experience unnecessary. Write for generous sample offer. SENT FREE.

MUNNY MFG. CO.
817 Main Street
Dept. 7-M
Cincinnati, Ohio

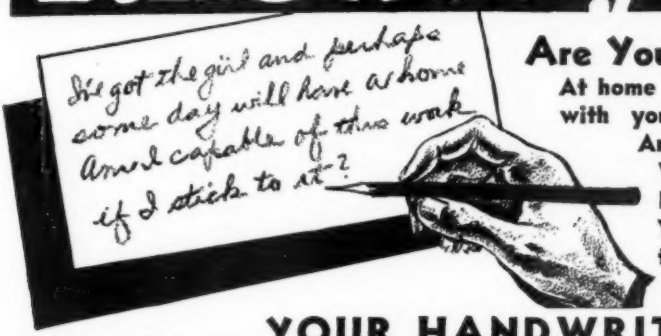


NEW CATALOG 16

For Boilers, Gas, Steam Engines, Castings for 40 kinds of these Engines. Pumps, etc., Electric and Water Motors, Gears, Material, Piston Rings. Blue Prints free with Castings. Send 25c for Catalog 16. Refund on 1st order.

Howard Engine & Mfg. Co.
2417 N. Ashland Ave., Chicago, Ill.

"Know Thyself"



Are You Happy
At home — with your sweetheart
Are you working
What's wrong
Is it *your* fault
Your writing tells the truth.

YOUR HANDWRITING ANALYZED FREE!

by M. N. Bunker, N. D., D. S. C., Ph. D., founder of the well-known American Institute of Grapho-Analysis, a chartered educational institution. Handwriting tells your character so accurately and intimately that it may surprise you. Hidden talents may be revealed, the things you should know. To "know thyself" allows you to develop favorable traits and talents, or to avoid the undesirable. Success or failure—your business, social or love affairs—all trace back to the proper use of talents with which you have been endowed.

The Man Who Wrote This

Can sell things if he tries. Makes friends, diplomatic, ready talker. His enthusiasm and ambition should get him the things he wants—the girl, the home, the happiness. Whatever he starts he will "stick to it" and carry it through. He must watch his temper and sarcasm, both faults that can be corrected.

• • •

Read Simple Rules

If you are over 16, able to read and write and can use $250.00, you are qualified. The specimen submitted must be your own handwriting and only one specimen will be accepted from a family. Write anything you like with pen or pencil—or write "What does my handwriting indicate?" Use the coupon or any paper—a postal card will do. The most interesting specimen submitted, in the opinion of the American Institute of Grapho-Analysis, will win. Replies will be property of Richard Day, Mgr. All replies must be postmarked not later than January 20, 1933. Duplicate prizes will be awarded in case of ties.

• • •

Be Prompt! I Will Send You a $100.00 Cash Certificate at Once

To make it worth your while to be prompt in sending your handwriting for analysis—if you will see that your letter is postmarked not more than three days after you read this notice, I will send you a Cash Promptness Certificate entitling you to an extra $100.00 in Cash should yours be the most interesting specimen of handwriting submitted in the opinion of the American Institute of Grapho-Analysis.

I WILL PAY $250.00

For the most interesting specimen of handwriting sent me for analysis. Not the fanciest — not the plainest — but the most interesting.

HOW YOU GET IT— You may write a letter if you wish, but you really need WRITE ONLY THESE FIVE WORDS, "What does my handwriting indicate?" Write with pen or pencil, on any paper—the coupon—or a postal card. Style and penmanship do not count. ANY handwriting will do and ANY may be the most interesting. You need not write fancy or even plain. Any handwriting may win. The farmer or mechanic has just as much chance as the school teacher. Mail this to my address and Dr. Bunker's brief report will be sent you promptly.

Interesting Chart Sent You FREE!— With the character analysis made from your handwriting you will receive absolutely FREE, a chart such as Dr. Bunker uses in his American Institute of Grapho-Analysis' work. With it you may tell something of the characteristics of your friends. It will be very amusing and somewhat mystifying we think.

If you write on a postal card or paste your coupon to it YOU NEED INVEST ONLY ONE SINGLE CENT in this opportunity to win a big cash prize. Proctor Morgan, Morgansfield, Ky., won $250.00 and a bedigreed Scottish Terrier. A. L. Teeters of Memphis, Tenn., won $200.00. Each of these folks invested ONLY A TWO-CENT STAMP! USE THE COUPON TODAY!

Simply sending your handwriting for character analysis qualifies you for the still further opportunity to . . .

Win $3,500.00 Cash

Or Studebaker 8 Sedan and $2,000.00 Cash

This stupendous prize is additional and entirely separate from the cash prize offered for the most interesting specimen of handwriting. Picture $3,500.00 for yourself—all yours—to be used as you like. Family, education, home, debts—surely you can use it. It's a little fortune—more than many folks life savings. Rush your handwriting to me now for your character analysis. Yours may be the winner!

RICHARD DAY, *Manager*
Dept. K-203-M
909 Cheapside Cincinnati, O.

$250.00 PRIZE COUPON

RICHARD DAY, Mgr., 909 Cheapside St., Dept. K-203-M, Cincinnati, Ohio

Here's my handwriting for a brief character analysis:

.....

.....

My name is.....

Address.....

Town..... State.....

I am to receive FREE a brief character analysis from my handwriting and a FREE Character Analysis Chart.

Classified Advertisements

MONEY-MAKING OPPORTUNITIES IN TABLOID FORM

Rates for classified ads, 15 cents per word per insertion, or 12 cents per word per insertion for six insertions. Minimum 10 words. Cash should accompany order. Closing date 20th of third month preceding date of issue. Address Classified Manager, Modern Mechanix and Inventions Magazine, 35 East Wacker Drive, Chicago, Ill.

AVIATION

SB PROPELLERS give better performance. New Special propeller for Henderson and Heath motors, diameter 5 ft. Hardwood only, $18.00 each. Send stamp for new propeller circular and prices on other sizes. Sensenich Brothers, Lititz, Pa.

BUILD Corben Baby Ace, complete kits including factory welded fuselage, tail unit, under carriage. Folder, dime. Corben Sportplane Co., Madison, Wis.

LET'S SWAP. Whatcha got? Whatdye want? Dime trial. Swapper Sportsman, Williamsport, Pa.

DON'T buy anything until you get Ort's 1932 Aviation Catalogue. Prices much lower. Send one thin dime today. Karl Ort, Box 522, York, Pa.

NEW Heath V Parasol A-1 condition, bolted, complete, less motor $229.00. J. Scimone, 30 No. Portland Ave., Brooklyn, N. Y.

METAL Tipped Propellers; Fords, $9.98; Henderson, $8.98; Harley, untipped $4.50; New Improved Heath ships $298.00; Bristol Cherub Tupe 40 H.P. motors $75.00. Photos, information including leather bound Flying Manual 25c. Hibbs, Ft. Worth, Texas.

AGENTS

FREE Booklet describes 87 plans for making $20-$100 weekly in home or office business of your own. Elite Co., 214-G, Grand St., N. Y.

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ANDY'S SHOP MAIL BOX

(Continued from page 22)

on the pick-up the wagon will roll plenty fast after momentum is gained. I have obtained 55 MPH on the level occasionally. I am thinking of building a midget car, motorcycle engine propelled, and would like to hear from any builders of such. You have a great magazine and all the mechanical-minded fellows around here prefer it to any other mech mag.

WARREN W. WHEELER

P. S.—No thrust bearing was used and a home-made hub was welded on the sprocket.

The remarks about the propeller being best at 4½ ft. diameter are interesting. We have right on this field, across the tarmac from here, a guy named Sam Wing (ever heard of him?)* who is making, despite his obscurity, a swell article on how a calculate a prop for any job and how to build that prop.

***Andy, you louse, I saw this metal on the stone when they were pulling proofs at the print shop. I'll let it stand without knocking it off onto the floor, but when the next issue of the Pack Mag comes out in Oct. I'll have a firecracker on every page for you. You'll pay for this, deacon. It just happens you won't see this until the magazine is on the press and locked up. Are you smarter or am I?—Sam W.**

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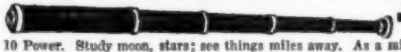

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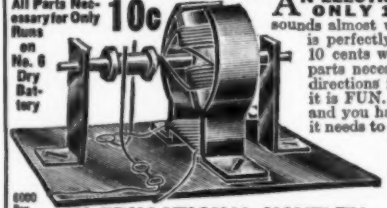

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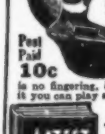

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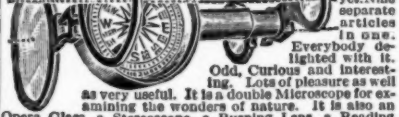

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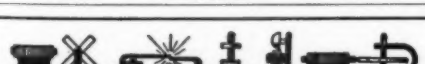

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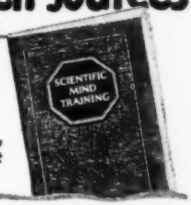

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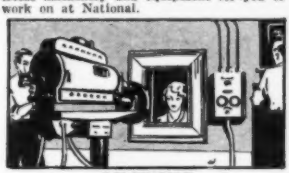

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How FRANK BUCK Filmed

Everyone who has seen Frank Buck's "Bring 'Em Back Alive," that amazing movie of jungle life, is asking the question: "How did they ever film that spectacular battle between a Bengal tiger and a 30-foot python? Was it faked? How did the cameramen happen to be on the scene—and how did they escape with their own lives?" Read the answer in this article.

Breathing in agony as the terrible coils of the python constrict around him, the tiger here appears to be coming out second best in the battle. Jungle fights are ended only by death, but the movie shows this battle as a draw. This interesting article tells why.

Flashing, sinuous, the coils of the serpent wind around the tiger with amazing speed, intent on squeezing the life out of him. Exhausted, the tiger tries to recover its strength while the snake relentlessly draws tighter. The snake had just emerged victorious from a battle with a crocodile. At left, Nick Cavaliere with the camera he used in "shooting" the battle. The pet monkey sitting on the machine supplied comic relief in the film.

WHO won—the python or the tiger?

This is the question which is bothering thousands of folks who have seen Frank Buck's startling movie of jungle life, "Bring 'Em Back Alive," and who have been vividly impressed by the incomparably spectacular scenes shown therein where a Bengal tiger, dreaded king of the jungle, battles the flashing coils of a deadly rock python thirty feet in length.

The picture shows the battle ending in a draw. But Marquis of Queensberry rules, as interpreted by the jungle, admit of no such thing as a draw. Battles there must inevitably end in death for one or the other fighter. That is the law. How, then, did both the python and the tiger escape with their lives after their amazing battle, which endures on the screen for fully ten minutes?

And how in the world did Frank Buck and his cameramen happen to be on the spot at the time? Skeptics, admitting the hair-raising effectiveness of the picture, raised the cry of "fake," pointing to the "Ingagi" hoax. This, you may remember, was another famous jungle picture purporting to reveal the lives of apes, who were later discovered to be movie actors dressed in monkey costumes. Obviously Buck's picture was not faked in this sense, for it was self-evident that the tiger and the python were flesh and blood creatures. But sus-

His TIGER-PYTHON Battle

by ALFRED ALBELLI

picions, once roused, were hard to down.

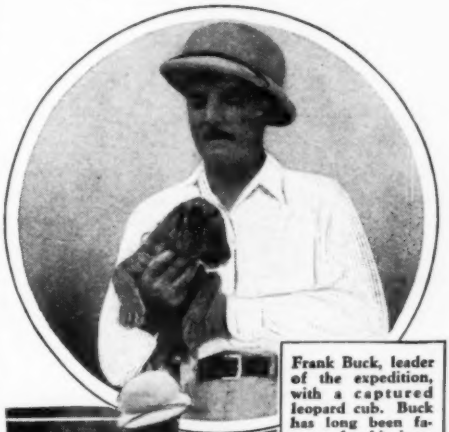
So I went directly to headquarters of the expedition to find out for readers of MODERN MECHANIX AND INVENTIONS just how the technical and mechanical problems of making this wonder-movie were solved.

Both Frank Buck and Nick Cavaliere, cameraman who shot many of the scenes, agree that the tiger-python episodes were the most spectacular in the picture. Just what happened during the filming is going to be told you now for the first time, by special permission of the copyright owners, so to speak.

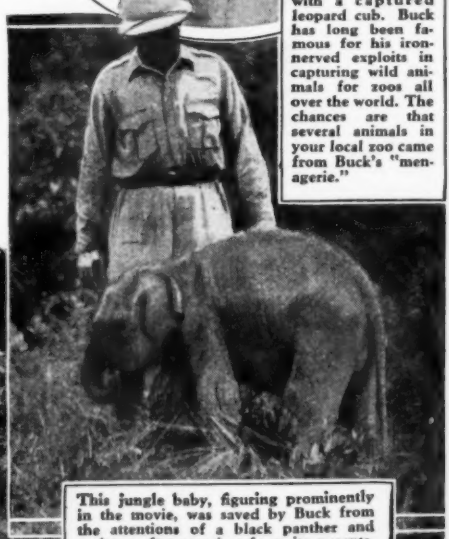
The success of the whole picture revolved around so simple a thing as a jungle water hole. The expedition spotted the water hole early in the game. It was the only one for miles around, and Buck, wise in jungle lore, knew that sooner or later animals in the district would come to it.

It was here that a python met a crocodile. This was not a coincidence, but strictly in keeping with the ways of jungle inhabitants. On this particular occasion the expedition was stalking a tiger which had been sighted in the vicinity by natives. Figuring that the tiger would show up at the water hole sooner or later, they repaired there, preparing their camera nests as shown in an accompanying drawing, but the first actors for their lenses proved to be the python and crocodile.

In the picture you see the two reptiles splashing and threshing in the water. You



Frank Buck, leader of the expedition, with a captured leopard cub. Buck has long been famous for his iron-nerved exploits in capturing wild animals for zoos all over the world. The chances are that several animals in your local zoo came from Buck's "menagerie."



This jungle baby, figuring prominently in the movie, was saved by Buck from the attentions of a black panther and a tiger, after straying from its parents.

Here is the water hole in the Malay jungles which explains much of the success of "Bring 'Em Back Alive." The only hole of its kind for miles around, it attracted scores of animals who passed under the lenses of cameras in nearby trees.

How cameras were arranged at the jungle water hole to film unsuspecting animals who came there and battled one another. The tiger encountered the python in a cleared space at the hole's edge. Two cameras, nested in trees, their operators shielded so the human scent did not carry to the beasts, registered the scenes. An automatic camera, strapped to a tree, recorded the action from a third angle.

Frank Buck lassooing a rare monitor lizard, lineal descendant of giant dinosaurs which roamed the world ages ago.

see the python insinuating its coils around the body of the crocodile, which apparently puts up a tremendous struggle. In reality the crocodile was no match for the snake. In the end the python breaks its opponent's neck. It is at this point that the tiger appears on the scene.

The thirsty tiger has heard all the commotion and he becomes very curious. Warily, he peers through the undergrowth and sees the python doing away with the crocodile. However, he is more concerned with satiating his thirst at this juncture than he is with doing battle.

The tiger lopes back and forth in the naturally camouflaged background. He juts his head upwards to get a view of the water hole clearing to see if the python has disappeared. After the snake slinks off, the tiger treats himself to a long and lusty drink. He must have been sick for water, as the native safari, led by Frank Buck, had stalked him that entire day in the baking sun.

All the time the cameras are clicking away furiously, ensnaring gratifying results for the expedition's leader. Throughout the proceedings Director Clyde Elliott and Frank Buck are watching the events with feverish anxiety, to make sure that movie instruments and beasts keep in range.

The native hunters were withdrawn when the tiger was steered toward the watering-hole where they knew he would find adventure and a reception committee of cameramen. I am going to tell you how the shots of the fights at the water hole were obtained.

Special nests were erected in the trees. These outposts were concealed by the luxuriant foliage of the region. From these high perches, which gave plainly on the battle-ground of the beasts, the photographers ground away. Just how these tree-garrisons were erected must remain trade-secret lore, the sole property of Frank Buck.

Returning to the python and his pros-

Dense shadows and a yellowish cast to the tropic sunlight complicated the work of jungle photography, even requiring the use of reflectors, as in this instance where the job of forcing a captured python into a box is being recorded.

pective antagonist: While the snake is recuperating from the rigors of the crocodile fight in the shade of a tree, the tiger looms in its presence. The sprightly tiger sniffs the air ominously and the camera crew get their cues from Clyde Elliott to get ready to "shoot" the jungle-land battle of the century.

Frank Buck, veteran of two decades of study of animal nature in the Malay land, has signalled to Elliott from his place in the tree-top that the tiger is sure to pick a fight with the snake. It is apparent to all from Buck's gestures that there's going to be plenty of action any second.

Suddenly and swiftly the tiger lunges at the python. He gets down to serious business right off and grabs the snake by the jaw. The tiger is striving to bite the python's head off.

It is apparent that this tiger has fought pythons before. He maneuvers to keep at a distance from the snake's deadly coils, and yet he clings with his jaws closed on the serpent's neck. They toss and tussle and pretty soon you see the python stealthily wrap its sinister body around the tiger. The coils begin to press and tighten.

Just when you begin to think that the tiger is going to join his ancestors, he manages to extricate himself and struts off. He roams around a little and suddenly returns to resume the fight, true to the code of the jungle.

This time the python gets the telltale stranglehold on him and again it looks as if the tiger will soon be pushing up daisies. The snake's grip seems to grow firmer and

This is the scene captured by the movie camera shown in action in the picture at the top of this page.

firmer, deadlier and deadlier. The tiger seems to be whirling helplessly, waiting on the fatal designs of the snake. But the tiger gnaws into the python's skin, tries to seize its head, and makes a last desperate effort to save itself from being squeezed and crunched to death.

The tiger's strength surpasses that of the python. The latter's tentacle-like grip is broken. It collapses from fatigue. The tiger slips from the python's nooses and keeps going.

That is how the battle ends in the picture. Obviously, it was a draw. But sponsors of the expedition told me that the tiger

Man-eating Crocodile Has No Chance Battling Python; Gets Neck Broken

A tiny honey bear, encountering a python coiled around a tree base, proved too slippery for the reptile's clutches.

A crocodile proved no match for a python. The snake broke the saurian's neck as easily as a man snaps a match in two, though the crocodile is quite capable of killing a man. At left, a tiger approaches a crocodile with an exploratory paw. In the battle which followed, they grabbed each other by the throte.

got by far the better part of the argument. The python's strength had given out by sheer exhaustion, having been weakened in the duel with the crocodile. Only a matter of minutes had elapsed when the tiger pounced on it.

The tiger, on the other hand, was satisfied that the python was vanquished. As for himself, he was just ruffled and mussed up a bit. Otherwise, I was told, the tiger would never have left the scene. Had the python fought the tiger without the previous battle with the crocodile, the serpent would have won easily, members of the expedition informed me.

An examination of the python's body showed that the tiger had sunk its teeth deeply and decisively into four places on its back. These wounds were responsible for its weakening and the eventual escape of the tiger.

A native then raised the battered python's head with a long stick. Frank Buck lassoed it with a rope and it was stuffed into a crate. Three hours later the tiger, who was pursued anew, grew weary of the chase and ran into a baited trap.

It was explained that the tiger became desperate for food and as its hunters kept it moving, it was prevented from falling on weaker beasts which it ordinarily fed upon. Consequently when it scented the buffalo meat which had been placed as a decoy in a trap—set up just in case such an occasion arose—it made madly for the interior of the improvised cage.

As the tiger snatched at the chunk of buffalo meat, it released a thin rope, then the perpendicular door snapped down to imprison the tiger. This made two valuable trophies to bring back alive. The tiger and the python are now neighbors in one of the largest zoos of the country.

Supplementing the standard types of cameras, an automatic DeVry camera was also used in getting shots of the battles featuring the python. This was to insure success. This type of camera, capable of running off 200 feet of film automatically, was installed on a tree limb and its lens trained on the scene to be filmed. It takes in everything within a radius of ten feet of the focal point.

Naturally there were other exciting episodes in the picture. You see the intrepid Frank Buck capture the rare monitor lizard, sole surviving descendant of the dinosaur and mastodon clan; and you behold him

Electric Jungle Trap Paralyzes Animals, Makes Them Easy to Capture

Designed especially for use in the Malay jungles where Frank Buck carries the most modern methods of animal trapping, this ingenious device may soon come into widespread use as a tiger trap. The illustration shows the parts exposed, though in actual practice the mechanism is camouflaged under foliage. A 1500-volt current of 1/20th ampere is sufficient to prostrate beasts stepping on the plates, disabling but not killing them. A circuit breaker shuts off the juice when its work is done, to avoid danger of fatal shock. A bell signal warns the hunter when the trap is sprung so he can recover the victim immediately.

grabbing the struggling python with his bare hands to jab him into a cage.

And there's the comic relief when the little honey bear unwittingly paws the slumbering python, gnarled about a tree during its siesta.

The bear was a pet of the native boys. He got out of his cage and sauntered off into the jungle fastnesses. On discovering that their pet was missing, the boys set out to find him. Their last glimpse of the bear is when the startled python snatches at it and clamps it in its deadly jaws.

The boys give up in despair. They realize there is no way of getting their pet from the clutches of the python. Much to their amazement, the honey bear returns to their camp a short time later.

Frank Buck has no explanation as to how the playful honey bear ever got out of the python's grip. He and the cameramen had given him up. That episode mystified them all.

One of the most sensational shots occurs when the bull buffalo actually licks the tiger who is set on preying upon his herd. Frank Buck has found that the horned buffalo, by virtue of its fiercely sharp headprongs, can vanquish the tiger nine times out of ten.

Delirious shudders possess you as you behold the ravenous tiger entering a Sakai village while the unsuspecting natives disport themselves in a nearby stream. A mother rescues her infant just in time in a deserted grove as a tiger is figuring with ferocious cunning how to grab the little tot.

Those are some of the surface thrills in "Bring 'Em Back Alive." One observes in this Van Beuren-RKO picture the composite panorama of jungle home life.

Let there be no doubts about the picture having been made "on location." It was filmed in the Malay Jungle, south of Siem, on the very line of the Equator. The forest growth bears indisputable testimony to that fact.

As for the sound effects, they are artificial. The sponsors of "Bring 'Em Back Alive" make no secret of the fact that Paul M. Robillard, the sound engineer, inserted them later.

(Continued on page 160)

Lock Sends Alarm When Burglar Makes You Open Door

When a hold-up man demands that you unlock your door so he can ransack your house, simply place the key in this new lock. A special notch sets off alarm to bring coppers.

THANKS to the development of a special lock and key, you can send in a burglar alarm while you are unlocking your door to enable your assailant to enter your house and attempt to make away with your valuables.

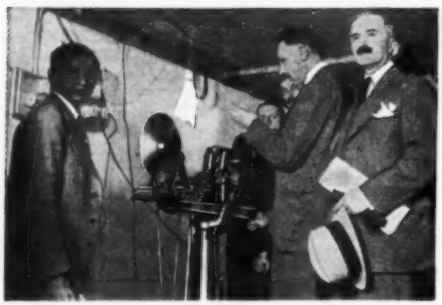
The attempt is as far as the hold-up man gets, for when you insert the key in the lock an imperceptible notch in the key operates an alarm switch to bring the coppers to the scene. Both lock and key in appearance are indistinguishable from the ordinary article, and may be set into any door.

Coming—The Talking Newspaper

THE day of the talking book, the talking newspaper and the talking magazine is foreshadowed in the recent invention of a French machine which reads from a strip of film-like substance any speech that is recorded on it.

The new process utilizes some of the principles of phonograph recording to inscribe the voice waves on a celluloid tape, wound in movie-reel fashion, as illustrated below. On this tape a furrow whose contours represent the vibrations of sound waves replaces the printed word.

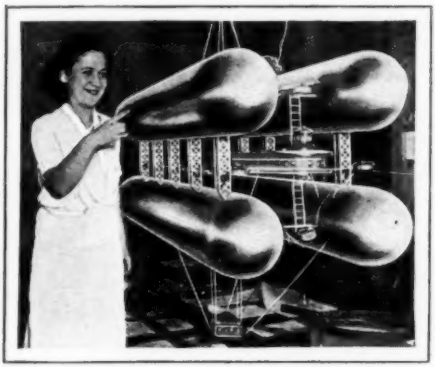
Reproduction of the voice may be performed immediately after recording. The former process is effected by the use of a photo-cell and loud speaker.



Here's the talking book being put through its paces at Paris demonstration. Voice is recorded on celluloid wound on small reel. Reproduction is effected with photo-cell and speaker.

New Airship Stands Still in Air

AIRSHIP models day by day grow more and more imposing. Latest out is super-ship shown in photo below, which was on display recently at the Inventor's mart in New York City. Buoyancy is provided by the four metal cylinders, which are hooked together in one vehicle by a system of girders. The completed ship would be all metal, able to land easily on sea or land, and in addition remain motionless in mid-air, in the strongest wind.



On display at inventor's mart was this all-metal airship, having four cylindrical gas bags braced with girders. The completed ship will be able to light on land or water.

Extremes of Temperature, Weight

THE heaviest and lightest and the hottest and coldest things in the world have been listed by Illinois University scientist.

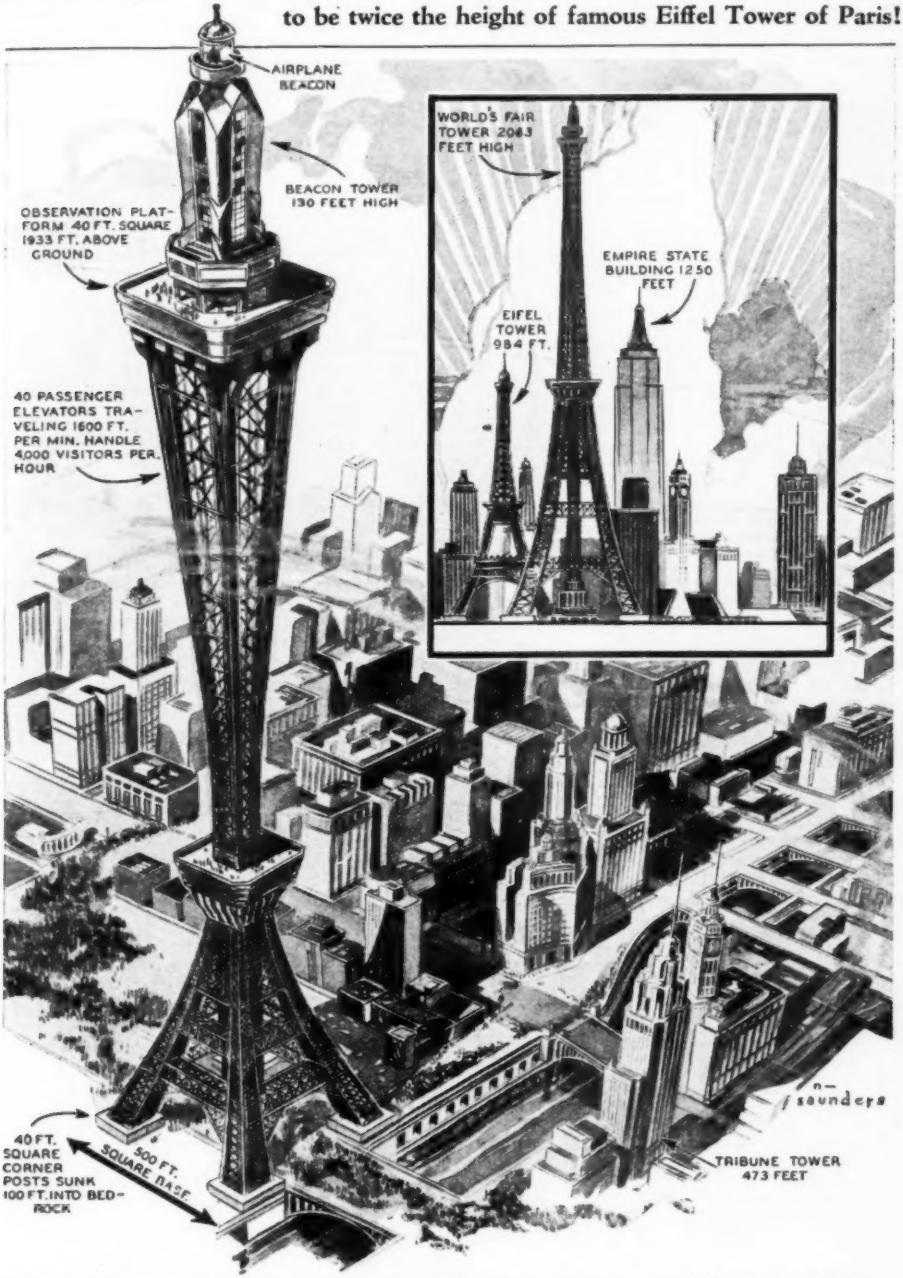
The heaviest familiar substance is the metal platinum, which is about twenty-one times heavier than the same volume of water, but two rare metals, iridium and osmium, are slightly heavier.

The lightest ordinary substance is hydrogen gas, which weighs about one-fourteenth as much as air, but the temporary "gas" of free electrons inside certain kinds of vacuum tubes probably is even lighter.

The hottest things on earth are electric furnaces with temperatures up to nearly 7000 degrees Fahrenheit. The coldest thing in the world is solid helium.

Chicago to Build World's Tallest Tower

to be twice the height of famous Eiffel Tower of Paris!


AIRPLANE BEACON
BEACON TOWER 130 FEET HIGH
OBSERVATION PLATFORM 40 FT. SQUARE 1933 FT. ABOVE GROUND
40 PASSENGER ELEVATORS TRAVELING 1600 FT. PER MIN. HANDLE 4,000 VISITORS PER HOUR
40 FT. SQUARE CORNER POSTS SUNK 100 FT. INTO BEDROCK
500 FT. SQUARE BASE
WORLD'S FAIR TOWER 2063 FEET HIGH
EMPIRE STATE BUILDING 1250 FEET
EIFEL TOWER 984 FT.
TRIBUNE TOWER 473 FEET
n— f saunders

Highest structure ever built by man will be this World's Fair observation tower, planned for erection in Chicago. According to architects it will rise 2063 feet into air, 1079 feet taller than the Eiffel Tower of Paris. $3,000,000 costs will be defrayed by admission charges. Insert shows comparison of height with other famous cloud-piercing structures.

West Coast Bridge Fans Can Sit in at New York Games

Bridge players from any part of country can sit in at tournament by watching this electrical annunciator board. Keys on the bridge table are operated to indicate plays on board.

A MECHANICAL boon to bridge fans, which will place the favorite indoor sport of 25,000,000 men and women on the same basis as big-league baseball, has been perfected by a Racine, Wisconsin, inventor.

This device is an electrical annunciator board, shown in the photo at the left, which enables an audience in any part of the country to watch a game, play by play, conducted in any other part of the country, no matter how remote.

Here's the way the device works. The bakelite top of the bridge table on which the tournament is being played is inlaid with a row of labeled switches, representing the different cards, bids, tricks, and players. These switches are connected with the electrical annunciator board with a special cable.

Immediately the cards are dealt, each player indicates his cards by pressing appropriate buttons; thus operating the annunciator board. As bids are made and tricks taken other buttons are likewise pushed.

Broncho Has Bucking Mechanism

THE display which attracted most attention in a recent Shrine parade held in San Francisco was a bucking broncho that only the mechanical-minded could figure out.

The vigorous and realistic bucking of the broncho was created by setting the wheels of the chassis on which it was mounted 1½ in. off center. The figure was made from laths and covered with imitation bronchohide to kid the spectators.

In tow of another car, the broncho cut some lively capers.

Chief center of interest in San Francisco Shrine parade was this bucking broncho. Wheels 1½ in. off center were responsible for the vigorous, realistic kicks of the "beast."

Black Light for Automobile Dashes

USE of ultra-violet rays to make visible at night the instrument panels of automobiles is foreseen as a possible result of development work being done with the ray by Westinghouse Electric & Manufacturing Company. Although these rays are invisible, they increase the natural fluorescence of radium dial markings so that instruments coated with radium are clearly visible at night.

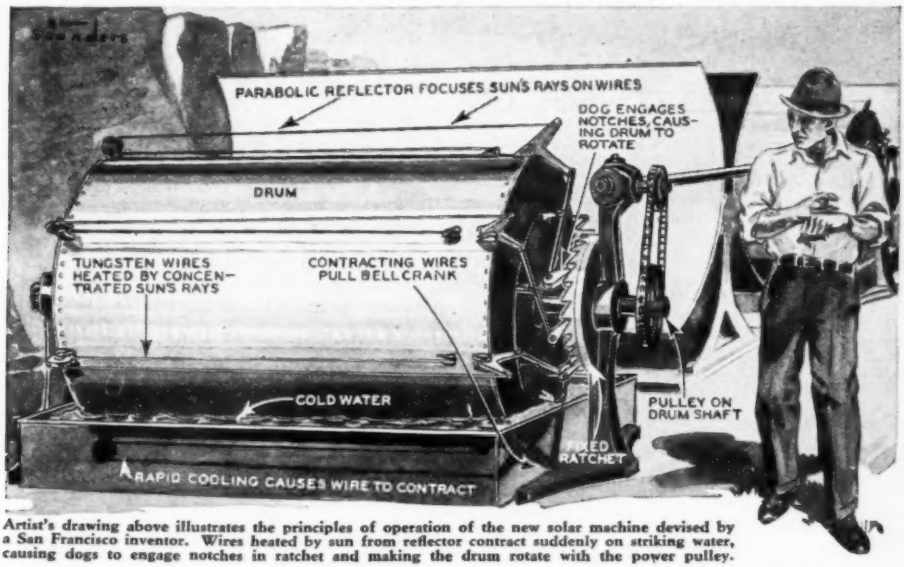
Texas Rabbits Roped Like Steers

THE jackrabbits they sure grow big in the Lone Star State. If you need graphic proof just take a look at the photo at the right. Believe it or not, but that thing hanging by its hind legs is a rabbit, and not an overgrown police dog.

These critters play a leading role in the rabbit roping contest held every year in the little town of Odessa, in Wild Western part of Texas. The idea of roping a rabbit does not seem so easy when you see what it is that gets roped.

If you don't believe jackrabbits grow big in Texas look at this photo. This one's just been roped.

Contracting Wires Harness Sun's Rays


PARABOLIC REFLECTOR FOCUSES SUN'S RAYS ON WIRES
DOG ENGAGES NOTCHES, CAUSING DRUM TO ROTATE
DRUM
TUNGSTEN WIRES HEATED BY CONCENTRATED SUN'S RAYS
CONTRACTING WIRES PULL BELLCRANK
COLD WATER
PULLEY ON DRUM SHAFT
FIXED RATCHET
RAPID COOLING CAUSES WIRE TO CONTRACT

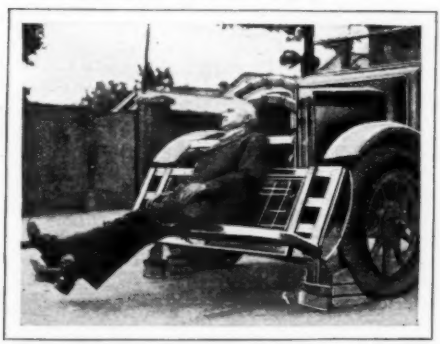
Artist's drawing above illustrates the principles of operation of the new solar machine devised by a San Francisco inventor. Wires heated by sun from reflector contract suddenly on striking water, causing dogs to engage notches in ratchet and making the drum rotate with the power pulley.

Auto Guard Scoops Up Pedestrians

AT LAST motorists have begun to consider the safety of pedestrians. This unusual tendency is disclosed in the invention of a device which its inventor, A. J. Grafham, of London, dubs the "Autosaver."

The device is attached to the front of the car as illustrated below, and serves as a net to scoop up the victim. When he is struck the "scooper-up" automatically tips back, so that the pedestrian remains out of harm's way. The wheels also have guards to deflect the pedestrian should he fall and miss the "Autosaver."

Protection against bruising is afforded by a padding of sponge rubber.



"Autosaver" attached to front of car scoops up pedestrian when he is struck. Ample rubber padding prevents bruising.

THE long, exhausting search of scientists for a method of harnessing the rays of the sun has yielded the solar machine illustrated in the artist's drawing above.

Operation of the machine is based upon the principle of contraction and expansion of tungsten wires. These wires are arranged lengthwise of a revolving drum, and the sun's rays are directed against them by means of a parabolic mirror on each side.

As the drum rotates the wires pass out of the focal range of the sun's rays and are doused in a trough of water at the bottom. Sudden cooling of the wires causes them to contract rapidly, pulling on a bell crank at the end of the drum. This action in turn causes the dogs to engage notches in the fixed ratchet and drive the drum around. Rotation of the drum causes the shaft to which it is fixed to revolve and operate the pulley on the same shaft. J. J. Warner, of San Francisco, is the inventor.

Here's Good Word for Cockroaches

A GOOD word for the detested cockroach and for the almost equally unpopular house centipede, is given in a recent pamphlet published by the British Museum in London. It is that these insects are bitter enemies of that still less popular creature, the bedbug. That bedbugs are now less of a pest than formerly may well be due less to the increasing efforts of housewives than to the slow spread over the world of these unsuspecting allies in man's anti-bedbug campaign.

Gold FAMINE Averted by

by C. MORAN

THE world-wide depression has made the country "gold conscious." It has forced many countries off the gold standard. It has left gold as the one product which has not suffered a decline in value. Many able economists have attributed the depression itself to a shortage of gold, pointing out that previous panics have ended with the discovery of vast new ore fields.

Whether or not they are right, the fact remains that people haven't paid so much attention to gold since the 16 to 1 days of Bryan's bimetallism. Thousands of jobless men are panning gold out of mountain streams; hundreds of prospectors are seeking out new ore bodies. And hundreds of abandoned mines are being reworked, their discarded tailings being processed to remove the gold still in them—at a profit.

Chemistry Increases Gold Reserves

It is this last factor which is most significant, pointing as it does to improved refining methods which increase the reserve of the world's metals immeasurably. Placer mining is the earliest and most primitive process of recovering gold, involving merely the simple process of washing free gold flakes out of sands, and being a purely physical method. Large-scale gold producers today depend on chemical methods, such as the cyanide process, to such good effect that the biggest American producer, the Homestake mine of South Dakota, is operating on low-content ore which, only a few years back, could not have been worked economically.

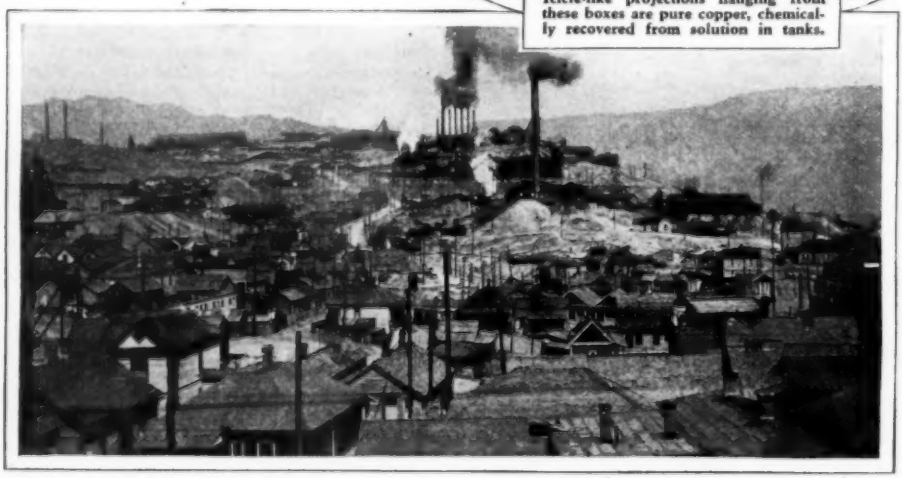
Obviously the world's supply of gold and of other metals is not inexhaustible. Some day mines will have to quit mining because there's nothing left to work on. By that time, perhaps, science will have developed methods of creating metals synthetically.

But as things stand at present mankind must, some day, face a metal famine.

Government Experts Gather Data

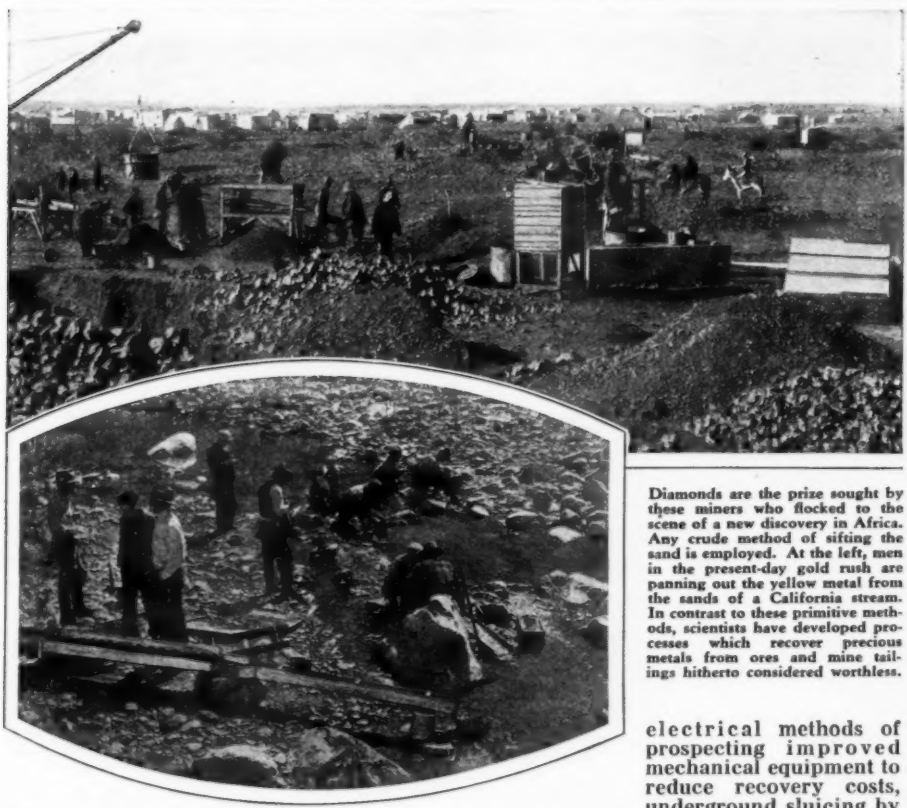
Fearful lest world reserves of basic metals should be inadequate for future needs, American industrial organizations requested the United States Department of Commerce to survey the potential supplies. The commission took the Government geologists and mineralogists to all parts of the world in a search for deposits. They went into famine-stricken China, into Rhodesia, into India, into the Federated Malay States, into South Africa. There, among hostile native tribes and suspicious foreign government agents, they explored existing

Icicle-like projections hanging from these boxes are pure copper, chemically recovered from solution in tanks.



"The richest hill in the world" is this one at Butte, Montana, from which millions of dollars in copper has been mined.

New RECOVERY Processes



Diamonds are the prize sought by these miners who flocked to the scene of a new discovery in Africa. Any crude method of sifting the sand is employed. At the left, men in the present-day gold rush are panning out the yellow metal from the sands of a California stream. In contrast to these primitive methods, scientists have developed processes which recover precious metals from ores and mine tailings hitherto considered worthless.

and potential world mineral resources.

By means of magnetic surveys and other forms of geophysical prospecting, and the application of newer knowledge in mining and metallurgy, the explorers found gold, copper, antimony, tungsten, manganese ore, tin—all in sufficient supply to satisfy world needs for many years. They discovered that although no one nation possesses sufficient resources of all metals and minerals to meet its own commercial requirements, there is no immediate danger of a world shortage.

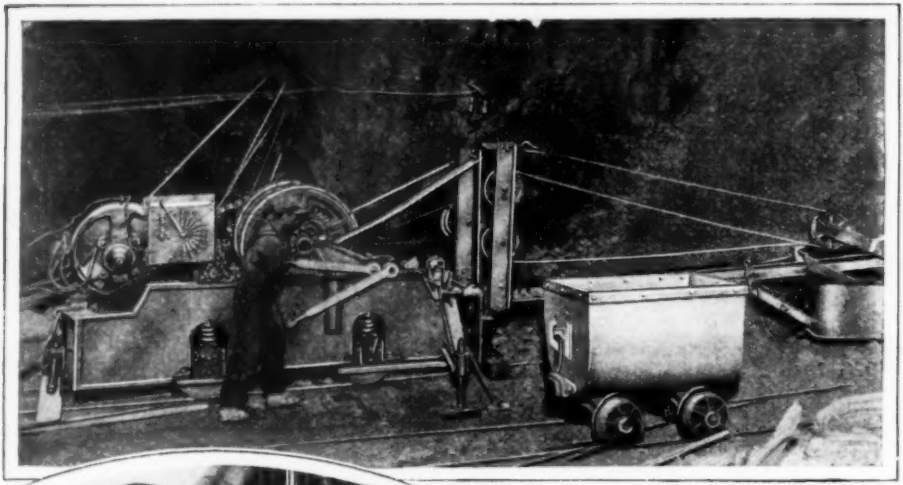
New Gold Strikes Likely

Recent technologic developments in prospecting, mining and metallurgy, according to these Government officials, promise to solve the world's problem of a diminishing gold supply. Indeed, they aver, it may be expected that by the use of improved technique in prospecting and mining, gold deposits comparable to those of California, Australia, and the Rand will be found in areas of the world that have not been intensively prospected. This technique includes electrical methods of prospecting improved mechanical equipment to reduce recovery costs, underground sluicing by means of scrapers, the flotation process of recovering gold from low grade ores.

"Canada," says Robert H. Ridgeway of the United States Bureau of Mines, "shows a pronounced increase in the trend of its gold production and may be expected to become more and more an important factor in world production. Production of Russia is still below its 1910 peak, but that nation has vast unexplored and undeveloped precious metal resources and should maintain its position as a prominent gold producer. Rhodesia and other parts of Africa are likely to continue their contributions of gold and offer much promise of possible new discoveries. South America, now relatively unimportant, may show increases due to further discovery and development. Stabilized political conditions in Mexico would undoubtedly be followed by mineral development, which would increase the gold production of that country."

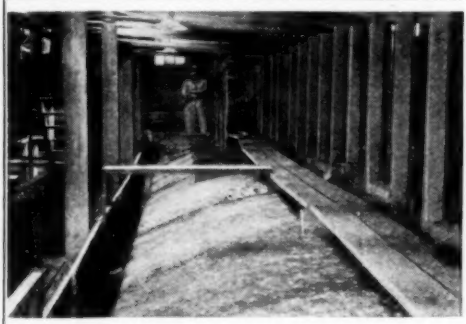
Magnetic surveys in a search for copper deposits have been made in many areas by

"Mechanical Miner" Digs Ore in Huge Quantities at Extremely Low Cost



Low-grade ores can be worked at a profit with this underground machine, which takes the place of many miners.

Grinding ore in government laboratory, preliminary to testing a new process for separating metal from worthless rock.



Ores are crushed and treated with oil in this bath. Rock drops to the bottom and the pure metal attaches itself to the oil froth at the top, from which it is recovered.

the Government geologists who report that although copper deposits have wide geographic distribution, the more important are confined to comparatively few mountain ranges, in the Cordilleran range of the Western Hemisphere, scattered from Alaska to southern Chile, and in the Sierra de Aranca of Spain in the Eastern Hemisphere. There are resources in southern Africa bounded on the south by the mountain range in Northern Rhodesia, and extending through the eastern part of the Belgian Congo to the Byanza Lakes on the north.

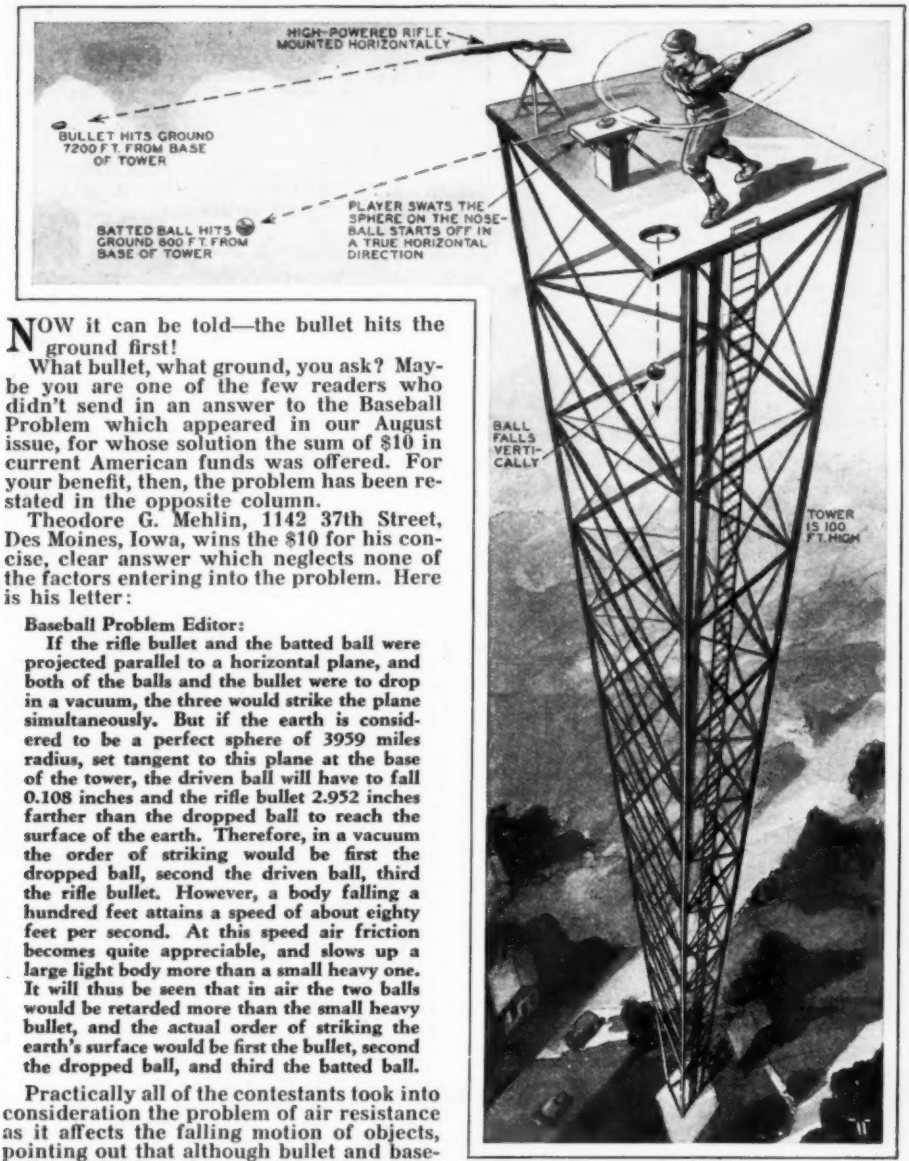
Important copper deposits have been found in the Michigan Peninsula and the Appalachian Range of the United States. The mineralogists estimate that copper reserves in this country are of such magnitude as to give no immediate concern of shortage. The principal deposits are in Arizona, Utah, Mon'ana and Michigan.

The object of magnetic surveys is to get an outline of the general geologic structure, and not, as is usually supposed, to locate the ore deposits. Knowledge of the geological structure, however, is essential to the intelligent search for ore bodies. Money is saved in prospecting by eliminating unfavorable areas for drilling and test pitting.

The world's aluminum industry has expanded greatly since the World War. Government mineralogists have located occurrences of bauxite in Gold Coast of Africa, in French Guiana, French Guinea (Africa), Ireland, India and Russia which constitute vast potential sources of aluminum. The United States, France and Italy also possess

(Continued on page 150)

The BULLET Hits the Ground First!


HIGH-POWERED RIFLE MOUNTED HORIZONTALLY
BULLET HITS GROUND 7200 FT. FROM BASE OF TOWER
BATTED BALL HITS GROUND 600 FT. FROM BASE OF TOWER
PLAYER SWATS THE SPHERE ON THE NOSE—BALL STARTS OFF IN A TRUE HORIZONTAL DIRECTION
BALL FALLS VERTICALLY
TOWER IS 100 FT. HIGH

The problem: From a 100-foot tower, a baseball player bats a ball, starting in a true horizontal direction, at the same instant a ball is dropped vertically. A bullet from a horizontal rifle is fired at the same moment, striking 7200 feet from base of tower, while the batted ball lands 600 feet from tower? Which object strikes the ground first?

NOW it can be told—the bullet hits the ground first!

What bullet, what ground, you ask? Maybe you are one of the few readers who didn't send in an answer to the Baseball Problem which appeared in our August issue, for whose solution the sum of $10 in current American funds was offered. For your benefit, then, the problem has been restated in the opposite column.

Theodore G. Mehlin, 1142 37th Street, Des Moines, Iowa, wins the $10 for his concise, clear answer which neglects none of the factors entering into the problem. Here is his letter:

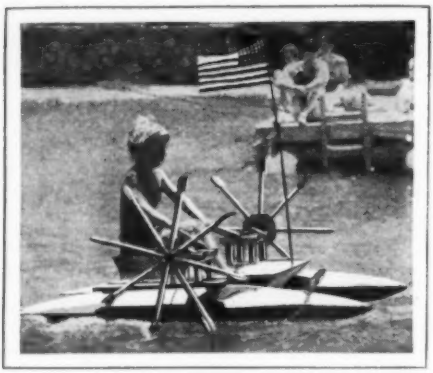
Baseball Problem Editor:

If the rifle bullet and the batted ball were projected parallel to a horizontal plane, and both of the balls and the bullet were to drop in a vacuum, the three would strike the plane simultaneously. But if the earth is considered to be a perfect sphere of 3959 miles radius, set tangent to this plane at the base of the tower, the driven ball will have to fall 0.108 inches and the rifle bullet 2.952 inches farther than the dropped ball to reach the surface of the earth. Therefore, in a vacuum the order of striking would be first the dropped ball, second the driven ball, third the rifle bullet. However, a body falling a hundred feet attains a speed of about eighty feet per second. At this speed air friction becomes quite appreciable, and slows up a large light body more than a small heavy one. It will thus be seen that in air the two balls would be retarded more than the small heavy bullet, and the actual order of striking the earth's surface would be first the bullet, second the dropped ball, and third the batted ball.

Practically all of the contestants took into consideration the problem of air resistance as it affects the falling motion of objects, pointing out that although bullet and baseball would fall at the same rate of speed in a vacuum, the heavy weight and small surface of the bullet would cause it to fall swifter than a baseball with its comparatively large area when the resistance of the atmosphere is considered.

Other entrants neglected to point out the factor injected by the curvature of the earth. Still others found it necessary to explain their solutions in more than 200 words, and by the conditions of the contest they were automatically excluded.

Youthful Skipper Hits Off 10 m.p.h. Clip on "Aquacar"



Young Buddy Barrud applying motive power (elbow grease) to crank of his "Aquacar," which develops speed of 10 m.p.h. Pontoons are canvas covered, six feet long.

A TWIN-PONTOON "aquacar" has solved all navigation problems for young Billy Barrud, of Lake Arrowhead, Calif. Eight paddles on each side wheel enable him to back up or speed ahead, merely by turning the handles in the direction he desires to go. Each pontoon is six feet long, canvas covered. Other parts are built from scrap wood. The boat is no slow poke, for it can hit off a neat clip of 10 miles per hour. $4 was the total cost of the contraption.

Why Women's Shoes Are Bigger

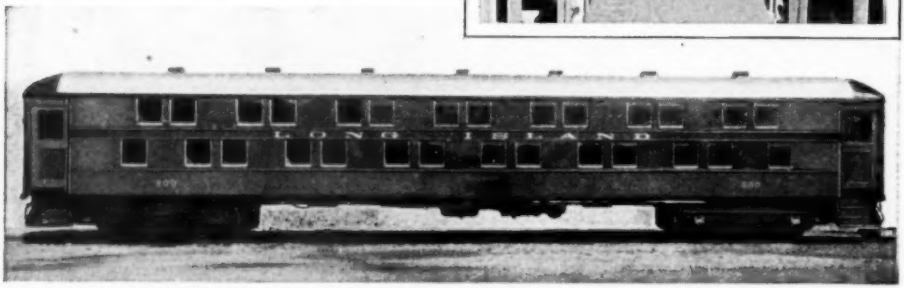
WOMEN'S shoes must be wider and differently shaped this winter because so many women wore sandals through the summer, is the prediction of a New York foot specialist. This summer's styles have marked what is probably the closest to bare feet that shoes can come, allowing an unprecedented degree of freedom to the foot.

Two-deck Railway Coaches Boost Train's Passenger Capacity One-Third

YOU'VE probably noticed that there's a lot of waste space up around the ceiling of a railroad coach. Well, this space is now to be occupied by passengers in a double decked train recently introduced by an Eastern railroad.

As you will see in the accompanying photo, the coach has a raised runway through the center which is elevated about two feet higher than the aisle in the ordinary one-deck train. Passengers desiring to take seats in the upper tier of seats need only walk up one step, while passengers with a yen for keeping beneath the center of gravity hop down one step. The passengers in the lower seats are adequately protected from debris from above.

Below is seen an exterior view of these new trains, which are to be tried out on the shorter runs of the Long Island railroad in the near future. Railway authorities claim that the cars carry about one-third more passengers than the other trains now in use. This will mean that the number of coaches can be reduced by one-third.

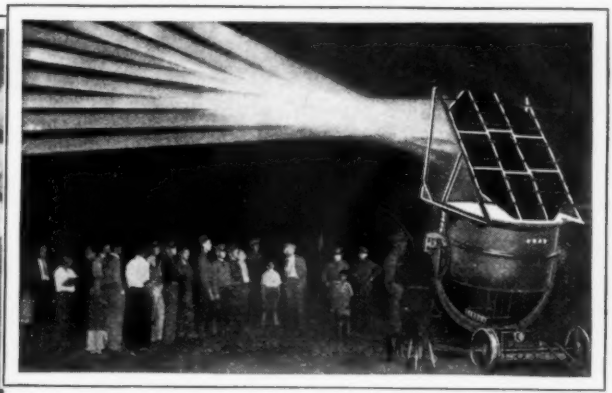


Interior view (top, right) of Long Island R. R. two-deck coaches shows arrangement of double tier of seats. One step upward takes passenger to upper tier, while one step downward leads to lower tier. Bottom photo shows exterior view.

Searchlight Traps Planes in Nine Beams

BEAMS FORM CHECKER BOARD ON SKY, COVERING TEN TIMES AREA OF ORDINARY SEARCHLIGHT
ADJUSTABLE MIRRORS BREAK UP MAIN BEAM INTO NINE SEPARATE BEAMS

With main beam broken up into nine separate beams, 10 times area of conventional searchlight is covered in sky, making escape of raiding planes impossible. Nine mirrors, adjustable to any angle, reflect rays from 800,000,000 c.p. light.



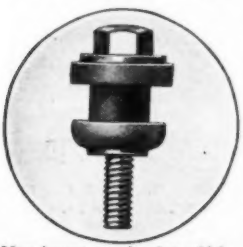
Nine-beam anti-aircraft searchlight being demonstrated at Fort Trotten, N. Y.

A REVOLUTIONARY departure in anti-aircraft searchlights, which has just been demonstrated at Fort Trotten, N. J., promises to make life hazardous for enemy aviators out on a night bombing expedition. The new idea is a battery of nine mirrors mounted in a special frame in front of the searchlight lens, breaking up the single 800,000,000 candle power beam from the light into nine separate beams, as illustrated in the drawing.

The chief benefit of the projection of nine beams is the enormously increased expanse of sky that can be covered for the entrapment of planes. Spreading a checkerboard of light on the sky, the new device covers ten times the area of the conventional searchlight. A battery of these lights placed at strategic positions about New York, experts claim, could protect the entire city, showing anti-aircraft batteries the position of every plane over an area of ten or more square miles.

The design of the mirrors is such that the beams do not interfere with each other, yet the entire area is evenly illuminated. In previous attempts at training two or more searchlights on a target the beams have actually shielded the target, since they were opaque.

New Repair Plug for Water Tanks

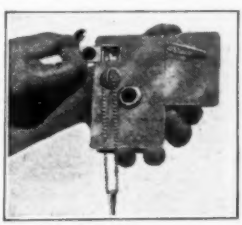


New instant repair plug which stops leaks in water tanks.

INSTANT and permanent repair for hot water tanks, gasoline tanks, or any other type of liquid container may be provided by a new type of repair plug now on the market. The plug, shown at the left, consists of an inner and outer water-tight washer which is bolted in place with a nut. A small hole must first be bored through the container for application, no pounding being necessary. The plugs are available in three sizes, ¼ in., ⅜ in., and ½ in. The plug will outlast the container.

Tokens Tell Who Entered Last

LOCK tampering is discouraged by an improved lock now being marketed which automatically records every entry and identifies the operator, thus fixing the responsibility for losses. Before the door can be unlocked, a token stamped with the name of the operator must be inserted. When the door is opened, the token falls into a section of the lock containing a magnifying glass, by means of which the identity of the last entrant is revealed. A special key gives access to the tokens in the lock.



Token bearing operator's name is inserted to unlock the door.

Nautical Park Has Drinking Fountain Like Ship's Binnacle

IN CARRYING out the nautical motif in the Jones Beach State Park, New York's newest and most pretentious sea-side resort, no smallest detail has been overlooked. The entire board walk and surroundings make you think you are on an ocean liner.

When it came to the task of applying a nautical design to the drinking fountains, the builders built them to resemble a ship's binnacle, as you will see in the photo below. The steering wheel controls the stream of water, which gushes up from where the compass card ought to be.

Nor does the marine motif stop here, for the games at the park are typical liner sports—shuffle board, deck tennis, quoits, and the like. Fortunately you don't get seasick.

Nautical motif carried through every detail of Jones Beach State Park, New York, is applied to the drinking fountain, with results shown above. Steering wheel controls water flow.

3-Tread Tire Lasts as Long as Auto

THE cat with nine lives has a rival in the form of a new automobile tire whose useful life is as long as that of the average motor car.

This new tire, developed by a leading inventor in the rubber field, has holes running crosswise through the tread, as shown in the photo below. These holes make possible the new advantages. They act as ventilators to dissipate heat generated in the rubber, permitting greater thickness. They also make the tire more easy riding.

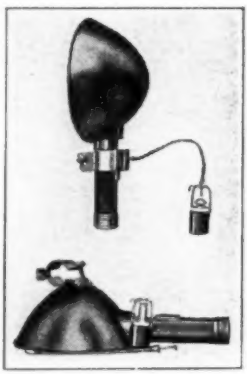
Tests indicate that a useful anti-skid tire life of 60,000 to 75,000 miles can be expected. By the time the treads have worn away, it is likely that the useful life of the car will have been ended.

Transverse holes in tires carry away heat and form new treads when tread above wears out. Tire is good for 75,000 miles.

Self-Timer Operates Photo Flash

EMPLOYING the special clamp shown in the accompanying photo, the person taking the picture can include himself when taking time or bulb pictures indoors with the new photoflash.

This clamp fits over and is tightened with bolt and wing nut around the battery case of the photoflash holder, offering at the same time a place to attach the exposure cable release to which is hooked the self-timer. The clamp is made of $\frac{1}{32}$ inch thick brass sheet stock, 1¼ inch wide by 6½ in. long, and shaped as shown. It is drilled and threaded to receive the cable at the arched or raised portion.

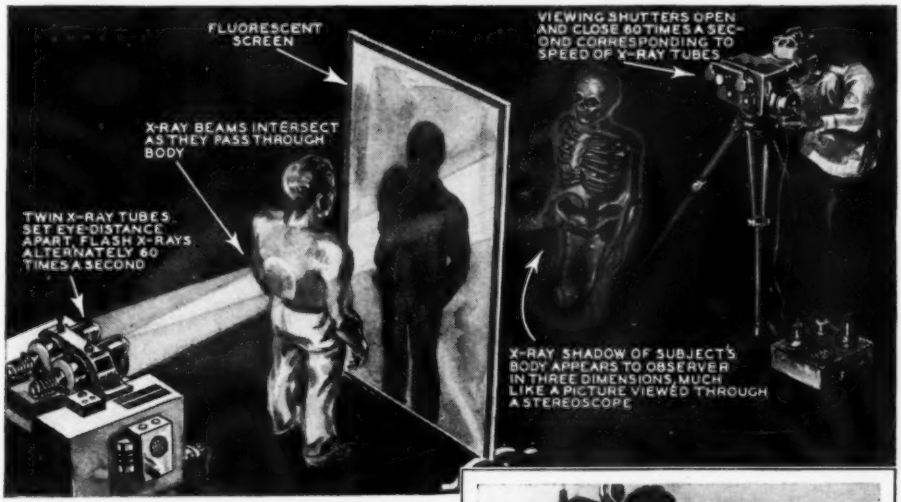


Clamp permits timer to operate photoflash for indoor pictures.

This raised portion fits snug around the switch plate and when it's against the metal band of the case the cable will be right over the switch button, which should be of the pressure, not sliding, type. The wing nut holds the contraption in place.

In use, you compose the picture in the finder, darken the room, and open the shutter to time as usual.

"Cross-eyed" X-ray Casts 3-dimension Image


FLUORESCENT SCREEN
VIEWING SHUTTERS OPEN AND CLOSE 60 TIMES A SECOND CORRESPONDING TO SPEED OF X-RAY TUBES
X-RAY BEAMS INTERSECT AS THEY PASS THROUGH BODY
TWIN X-RAY TUBES SET EYE-DISTANCE APART FLASH X-RAYS ALTERNATELY 60 TIMES A SECOND
X-RAY SHADOW OF SUBJECT'S BODY APPEARS TO OBSERVER IN THREE DIMENSIONS, MUCH LIKE A PICTURE VIEWED THROUGH A STEREOSCOPE

Artist's drawing above depicts operation of "Cross-eyed" X-ray. Two interrupted beams pass through patient's body and project three-dimensional image on other side of fluorescent screen. Shadowgraph is viewed through shutters which interrupt beam 60 times per second.

X-RAY shadowgraphs have heretofore displayed only two dimensions, height and width, but with the recent development of the "cross-eyed" X-ray a third dimension, depth, is added, making the image appear like a sculptured skeleton.

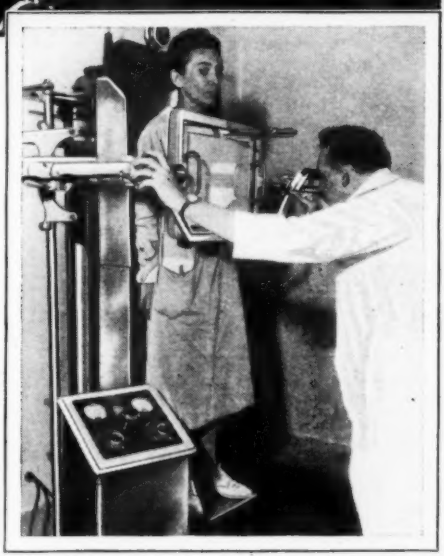
The three-dimensional X-ray is the invention of Prof. Jesse W. Du Mond, a Pasadena, California, scientist, who calls his instrument a "Stereofluoroscope."

The main element of the machine is a pair of X-ray tubes whose beams, directed against the patient as illustrated in the drawing above, intersect in the body, thus casting shadows in two different planes.

Passing through the fluorescent screen behind which the subject stands, the X-ray beams form out in front a three-dimensional, ghost-like shadow, which is so realistic it may be actually measured by calipers to determine size and shape of internal body cavities and bones.

The observer peers through a special viewer having a shutter which interrupts the eyesight in synchronism with a shutter breaking up the X-ray beam 60 times per second, four times the speed of the movie. This high speed interruption has the effect of building up in the brain the illusion of a steady, lifelike, three-dimensional likeness of the patient.

The "cross-eyed" X-ray will find widest use in the field of setting bones and locating foreign bodies such as bullets and shrapnel. Where the old-style X-ray shows only a flat view, the Du Mond machine shows the entire structure of the body at a glance.

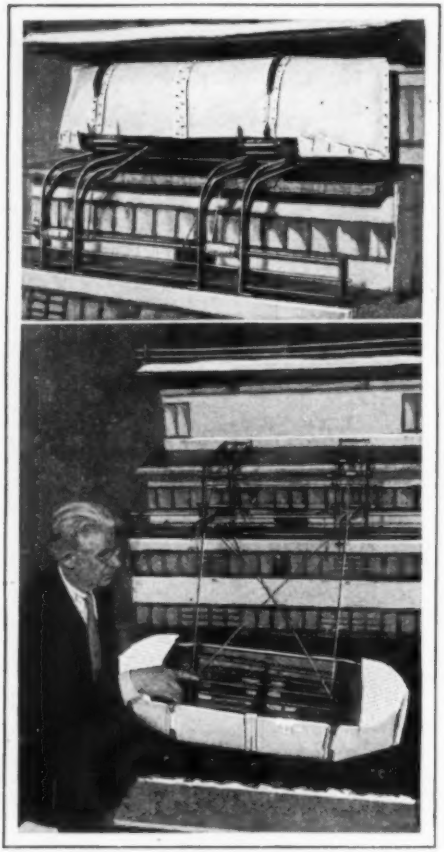


Dr. Jesse W. Du Mond, Inventor of the ghost X-ray examing innards of patient with his invention, called "stereofluoroscope." He is shown peering through the shutter.

Monkey Apes Humans, Kills Self

FROM the Chester, England, zoo, comes the story of the monkey that performed the unprecedented act of deliberately committing suicide. The simian first gnawed off a length of his trapeze rope, then tied one end to a branch of a tree. In the other he tied a running hangman's noose. Then he climbed to the topmost branch of the tree, inserted his head in the noose, and jumped off, instantly strangling himself to death.

New Lifeboat Can Be Launched Safely in Roughest Seas



Easily launched in roughest seas, this new 250-passenger lifeboat is kept always on even keel by automatic lowering mechanism and special outrigger which keeps the ship's hull at safe distance. Top photo shows how the boat is stowed away on upper deck when not on rescue duty.

LAUNCHING a lifeboat successfully in onrushing, mountainous seas many times becomes a hopeless impossibility. A new lifeboat recently invented, however, promises to enable all passengers of a stricken ship to get off safely. The boat swings out on a special pair of davits, but is kept always on even keel by attachment to a single control shaft operating both lowering lines. In addition, an outrigger on the sides keeps the boat well away from the ship's hull, so that there is little danger of a crashing blow, spilling all occupants.

When not on rescue duty, the boat is tucked away upside down on an upper deck, as illustrated in the top photo at the left.

Illumination for Phone Dial

A VERY useful device is a new light which clamps on the neck of your telephone to illuminate the dial. The light operates right off the house current, a convenient switch being located on the top of the reflector.

Attachment illuminates dial.

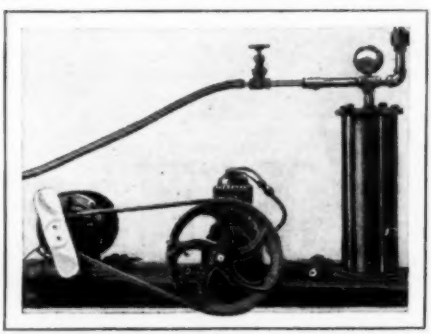
Linoleum on Floor Kills Germs

THAT ordinary linoleum is almost certain death to germs which happen to land on it is reported by a German scientist. In tests cultures of typhoid germs and of other common germs able to produce disease were spread on strips of ordinary linoleum much as though they had been spilled on a linoleum-covered floor. After 24 hours virtually all of the germs were dead.

The antiseptic abilities of the linoleum are due, it is believed, to the presence in it of a chemical called linoxyn, derived from the linseed oil which is one constituent of linoleum. Linoxyn is a powerful germ killer, not unlike some of the drugs used by surgeons as antiseptics. Too frequent washing in watery liquids may lessen the germ-killing power.

Make Your Own Shop Spray Gun

UNDOUBTEDLY you can find good use for an air spray gun in your workshop or garage. If you need one don't let lack of materials baffle you, for you can procure the ¼-h.p. motor from an old washing machine. The compressor can be a two-cylinder type used on some trucks for pumping tires. As for the air container, it can be made from a piece of 6-inch pipe sawed and filed smooth on the ends. The plates on the end are held in place with ong bolts and made air tight with rubber gaskets. The belt can come from an auto.



Old parts from junkyard make up handy shop compressor for spray gun. Fan on shaft of motor keeps windings cool.

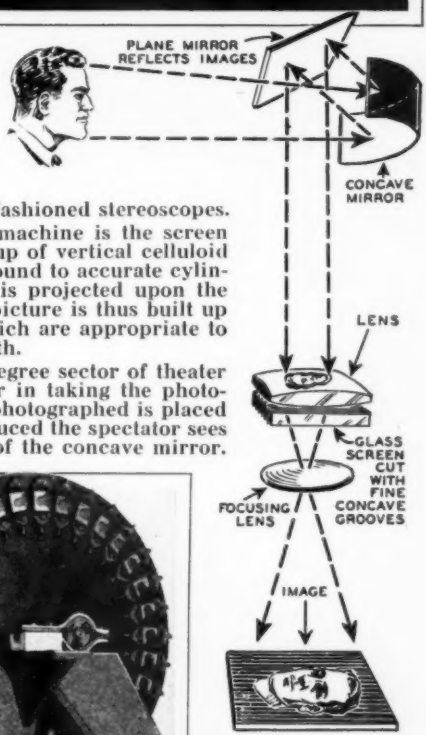
Machine Gives Movies Illusion of Depth

Basic element of depth-producing system is the screen made up of vertical celluloid rods. Refraction of the picture elements through celluloid gives the three-dimensional effect.

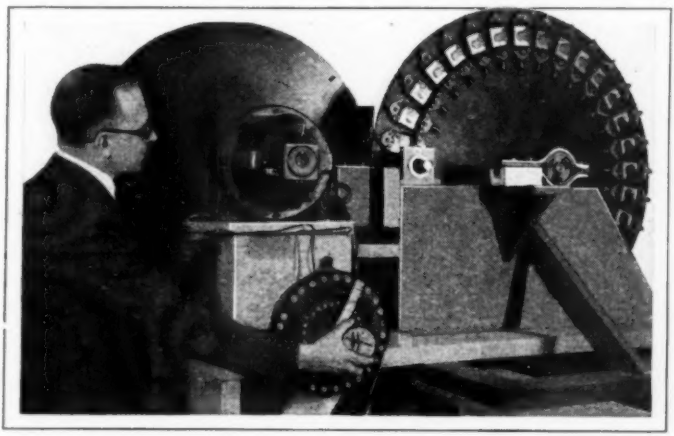
MOTION pictures are being given another eye. Recently in the Academy of Sciences, in Washington, Dr. Herbert E. Ives, internationally known engineer, produced motion pictures that gave the illusion of depth, making them appear like views in old-fashioned stereoscopes.

The basic element of the depth-producing machine is the screen upon which the image is thrown. It is made up of vertical celluloid rods, each about one-fourth inch wide, and ground to accurate cylindrical curve in front and rear. The picture is projected upon the screen by a lantern situated behind it. Each picture is thus built up of two different series of picture elements which are appropriate to right and left eye, creating the illusion of depth.

In order to avoid distortion within the 60-degree sector of theater seats, Dr. Ives makes use of a concave mirror in taking the photographs, as illustrated above. The object to be photographed is placed at the focus of the mirror, so that when reproduced the spectator sees the picture with each eye as from one angle of the concave mirror.



A schematic diagram showing how the photographing apparatus is arranged, so that pictures may be produced on the movie screen appearing the same from all angles. The concave mirror catches the image as it would be viewed from all angles, and transmits it through a glass screen of fine concave grooves, thus breaking up the image into a series of lines spaced regularly across the photographic plate. These plates act as the movie film.



Dr. Ives, famous engineer, at the controls of his machine which projects pictures with the illusion of depth. Note that individual photographs are set in frames in periphery of disc, beam from arc-light being projected through these onto screen. The machine is not yet adaptable for use of films as used in movies, but improvements are expected to make this possible. Pictures with color and sound synchronization will also arrive soon.

WEATHER FORECASTERS

Uncle Sam's weather experts can now predict forest fires along with the weather, for they learned that disastrous blazes start when moisture in the air diminishes to the danger point. Read how foresters mobilize data and equipment to do battle with conflagrations.

by **CALVIN FRAZER**

FARMERS, sailors and people in various other walks of life have long been in the habit of conducting their affairs according to the weather. Now the foresters and lumbermen have discovered that they, too, must keep close watch of the weather and regulate their undertakings accordingly, unless they are willing to see the timber riches of the country go up in smoke.

And Uncle Sam's weather prognosticators have taken a new burden upon their already overloaded shoulders. The blame for a forest fire is now laid at their doors if, before it happened, they failed to predict the occurrence of "fire weather."

Low Humidity Brings "Fire Weather"

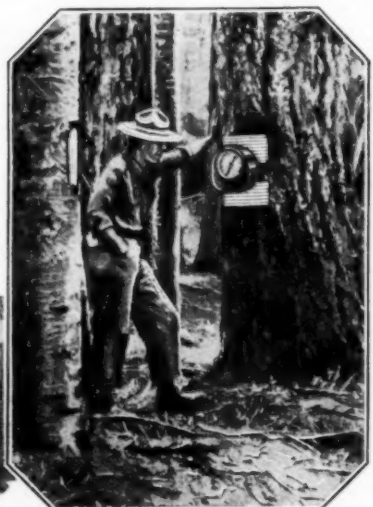
The term I have just used is still unknown to American dictionary-makers, but it is familiar to everybody connected with either scientific or practical forestry in the United States and Canada. It is applied to all atmospheric conditions that favor the origin and spread of fires in the forests.

What these conditions are was not well understood a few years ago. It has, of course, always been realized that a dry forest is more inflammable than a wet one, but a great deal too much importance was formerly attributed to the single element of rainfall as determining the amount of moisture in the forest materials.

We now know that the litter that forms the chief fuel of a forest fire dries out very quickly if the humidity of the air is low and tends to remain moist if the humidity

Above is seen radio operator-observer on "fire-weather truck" issuing warnings over radio so that fire-fighters can be kept informed of weather conditions.

When big conflagration breaks out in forest this "fire-weather truck" is rushed to scene, where weather maps are drawn and warnings broadcast.



Weather bureau expert reading hygrometer which tells relative humidity of the atmosphere.

COMBAT FOREST FIRES

is high. This statement applies to what is technically called "relative" humidity, meaning the ratio of the amount of invisible water vapor present in the air to the greatest amount the air can contain at the prevailing temperature. This ratio is expressed as a percentage.

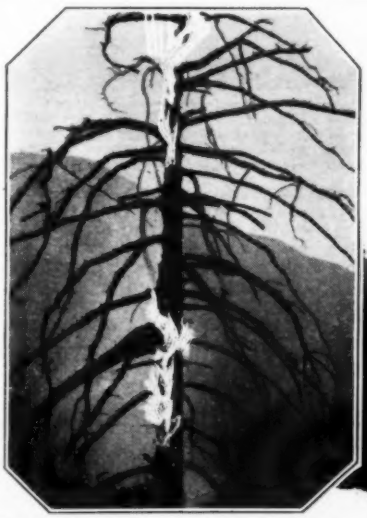
In the famous Douglas fir region of the Pacific Northwest the importance of this weather element as an index of the fire hazard has come to be so well recognized that instruments for measuring it are now found in all the big logging camps, and a logger cannot get insurance on his equipment and felled timber unless he agrees to suspend work whenever the humidity falls below 30 per cent.

Loggers Must Know Their Science

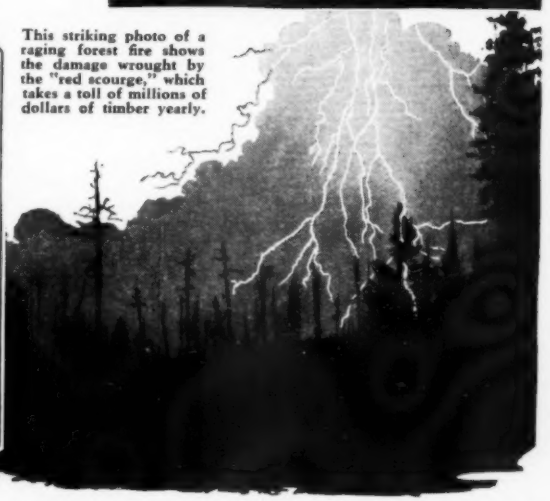
The lumberjacks in that region, many of whom had never heard of humidity a few years ago, talk about it nowadays as glibly as they do about tote-roads, skidways and stumpage. They lay wagers on the lowest humidity reading of the day, and they watch with eager interest the instruments that show when the danger line of atmospheric dryness has been reached and when smoking, along with all other fire-using processes, is consequently prohibited.

In recent years there have been many striking illustrations of the close connection existing between humidity and fires. Thus the great conflagration that raged in northern Minnesota in October, 1918, in which several towns were wiped out and

This striking photo of a raging forest fire shows the damage wrought by the "red scourge," which takes a toll of millions of dollars of timber yearly.



Dead tree ignited by stroke of lightning during a "dry" thunderstorm in which no rain falls to extinguish the flames. From these sources great forest fires grow. Forest fire lookouts must keep watch for incipient blazes.



Lightning bolts scattering themselves among the timber are the leading cause of destructive blazes in the western forests. A single storm has been known to start more than 300 fires. Unfortunately many lightning storms come unaccompanied by rain, so that trees are just so much dry tinder.

Logging Camp Workers Knock Off When Humidity Sinks Below 30%

Above—Forester measuring humidity with psychometer. When humidity lowers past the danger point warning is broadcast to mobilize firefighting equipment for emergency. At left is shown a relative humidity bulletin at a logging camp.

hundreds of lives were lost, began abruptly when, during a period of low humidity, a passing storm whipped together a few neglected brush fires. It ended as abruptly with a change in the general weather situation involving a marked rise in humidity.

On September 17, 1923, Berkeley, California, came near being destroyed by a fire that started in a brush field and forest at the edge of the town. After many buildings were ablaze the storm area that had caused the sudden development of fire weather passed far enough to the east so that the wind reversed its direction, and moisture-laden air from the Pacific flowed inland. The fire was then quickly brought under control.

Forest Litter Is Tinder in Dry Weather

Many natural factors, atmospheric and otherwise, affect the spread of forest fires. A steep slope helps to spread a fire because the materials at the top of the slope are quickly dried and rendered combustible by the hot air rising from below. The amount of litter lying on the ground is an important factor, and the character of the living trees and underbrush affects the situation, but the dominant factor is the dryness or wetness of the forest fuels, and this, as we have stated, is dependent in a marked degree upon the relative humidity of the atmosphere.

Forest fire lookout stations like the above are now outposts of the Weather Bureau as well. Force of wind measured by anemometer at left and relative humidity shown by hygrometer on wall, are relayed to central weather station.

A protracted drought does not make the forest dry and inflammable if the humidity of the air remains high. Wind tends to increase the fire hazard through spreading the flames and scattering embers, and also because, other things being equal, evaporation increases with wind velocity; but if the wind is moist it will, instead of fanning the flames, tend to hold the fire in check. A very damp wind may even act as a fire extinguisher.

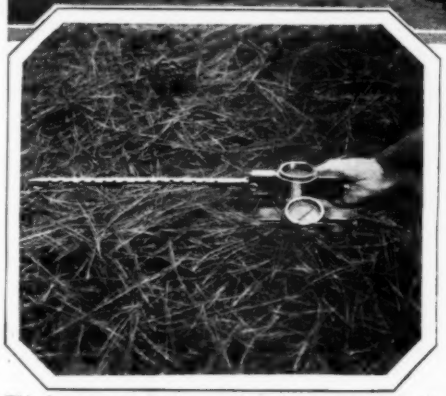
Lightning Worst "Fire Bug" of Nature

Lightning is the only atmospheric agency that can actually start a fire, and it plays a prominent part in fire weather in the Western forests, where a large percentage of lightning storms are attended by little or no rain. A single thunderstorm has been known to start more than 300 fires.

Protecting the forests from fires is a gigantic task — actually far beyond the

Sudden Shift of Wind, Bringing Increased Moisture, Halts Raging Fire

Sudden increase of moisture in the air halted the spread of blazes in this disastrous fire which occurred in Berkeley, California. Direction of wind shifted, bringing in moisture-laden air from the Pacific ocean. At right — Testing inflammability of rotten wood.



This instrument tells how much moisture there is in the forest litter. When debris of dead leaves, logs and branches lying on the ground reach certain state of dryness, the material forms ideal tinder for starting forest fire.

power of the governmental and other organizations that now attempt to cope with it—but advance notice of fire weather greatly facilitates the task through enabling the protective agencies to concentrate their efforts at the right times and places.

It permits loggers and sawmill operators to take special precautions when the fire danger is greatest, and it guides the fire-fighting units in mobilizing and distributing their men. After a fire is in progress, information of coming weather changes is almost equally valuable to those combating it.

Instruments (called "duff hygrometers") that measure directly the amount of moisture in the forest litter are used to some extent in certain localities as a gauge of the fire hazard, but the chief reliance of American foresters, loggers and lumbermen in estimating the inflammability of the forests is the "fire-weather service" maintained by the Weather Bureau with the cooperation of the Forest Service and various other official and unofficial agencies.

The predictions of fire weather issued by the Weather Bureau, during the seasons of fire danger, in all the principal forested areas of the country are based partly on the general weather situation, as shown on the daily weather map, and partly on telegraphic reports from special weather stations scattered through the forests, including many fire-lookout stations and other posts maintained primarily for other purposes.

Fireproof Periods Predicted

In some cases the forecasts indicate not merely that fire weather is at hand but also the degree of danger expected. Predictions are also issued of periods when the forests are safe from fire, on account of rain or high humidity, and when, therefore, it is prudent to burn slash and perform other operations that would be hazardous in dry weather.

Radio broadcasts are extensively used in distributing these announcements, and the forest telephone lines are pressed into service for the same purpose. An interesting adjunct of the service—at present employed only in California—is the "fire-weather truck." This is an automobile carrying a radio outfit, weather instruments and two men, one of whom is a weather forecaster.

Window in Cow's Stomach Shows Digestive Processes

Dr. Clausen, of St. Paul, Minn., inspecting interior of cow's stomach through window which he installed in her side. Effect of yeast on digestion is being carefully studied.

THERE'S one cow that has one thing no other cow in the universe can boast—and that's a window in her side.

This innovation is the work of Dr. P. L. Clausen of St. Paul, Minn., who installed the peep-hole for the purpose of studying the effects of yeast and various types of food on the digestion of cattle.

The installation job was simple. Dr. Clausen simply put the bovine under a local anesthetic, cut a hole one and a half inches by three inches in her side, then made an opening of the same size in her stomach. Then he sewed the flap of the stomach tissues to the opening in the hide, affixed a window framed in silver, and sat down to watch digestive processes.

It is reported that the cow felt not the slightest discomfort during the operation or since.

Prevents Bike Light Burn-out

INCREASING speed of a bike sometimes causes frequent blow-out of head-lights that are powered from a dynamo operating off the front wheel. This danger is eliminated, however, by a German invention which fits on the shaft of the dynamo to adjust the speed of the armature. The larger diameter of the cone comes in contact with the tire at the higher speeds, thus cutting down the voltage.

Cone on dynamo shaft adjusts voltage to prevent burn-out.

Why So Many Murders in U. S.?

NO LESS than six American cities, homicide statistics disclose, have more murders in proportion to their population than any other city in the world. The chief reason for this American murder habit statisticians believe, is the prominence given to crime in newspapers and movies. The second is the easy availability of firearms. Third is the slowness of American murder trials and the relatively large chance that conviction can be escaped. Next is listed the practice of capital punishment, which tends not to be enforced. Above all, is the public apathy about crime.

Will Power Operates Gramaphone

YOU can take this story as seriously as you want to. It came to us as perfectly legitimate stuff and here it is:

Major Raymond Phillips, O.M.E., late member of the Inter-Allied Commission of Control, claims to have evolved apparatus which will cause a gramaphone or kettle to function entirely by will power.

Major Phillips explains that the human body acts as an earth and the constant capacity is maintained within three yards of the apparatus. A momentary pause in the flow to earth through the body—produced entirely by mind concentration—is followed by an upward surge of sufficient intensity to cause a series of relays to operate.

That's the story. You can take it or leave it. We have a sneaking suspicion that somebody is being kidded.

Believe it or not, but these two people are exercising will power to set kettle boiling and gramaphone playing.

"Camera Clock" Times Olympic Races to 1/100 of a Sec.

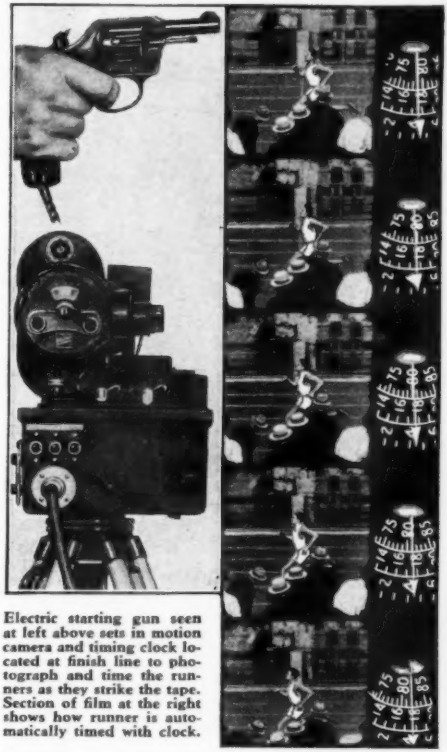
WHO were the winners of the races at the 1932 Olympiad held recently in Los Angeles was determined with the utmost precision by means of the new electro-photographic "camera clock" invented by Gustavius A. Kirby, ex-A.A.U. head.

The device consists of three basic parts —an electrical starting gun, a slow motion camera, and a timing clock reading in hundredths of seconds.

At the report of the starting gun, the camera and timing clock are set in motion at the finish line. As the runners arrive at the finish line they are photographed along with the clock showing precisely the moment they strike the tape. How the film which reveals the winner appears is shown in the accompanying photo. Difference between first and last photo is only 3/100 of a second.

In the 100 meter final race at the Los Angeles Olympiad, this "camera-clock" showed Eddie Tolan won over Ralph Metcalfe by only two inches. The pictures revealed that Tolan got his chest over the tape first and was thus adjudged the winner.

Tolan's time by the camera clock was 10.28s. as compared with the official hand time of 10.3s. equalling the world's record.



Electric starting gun seen at left above sets in motion camera and timing clock located at finish line to photograph and time the runners as they strike the tape. Section of film at the right shows how runner is automatically timed with clock.

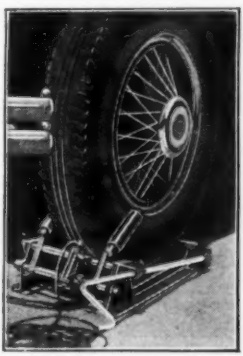
Thief-proof Bag for Golfers

LATEST in golfers' accessories is the thief-proof golf bag invented by Jerome Barlow, of Chicago, Illinois. What baffles the unauthorized person bent upon making away with or borrowing your clubs is a plate that locks over the mouth of the bag, at the same time permitting the handles of the club to stick out in the usual manner.

Plate with holes for handles is locked over mouth of golf bag to guard clubs against unauthorized removal.

Grooving Machine Cuts New Tread

THANKS to a new tire grooving machine recently invented, it is now possible to make your tires do duty a little longer and with perfect safety when slippery streets are encountered. How the machine operates to cut new grooves in your tire is demonstrated in the photo at the right. The wheel is jacked up, and the tire then let down on the rollers. Turning the crank rotates the wheel and brings against the rubber a tool with a cutting edge. After five or ten minutes your tire will have a tread almost as good as new. A pair of guides on the side insure an even cut.



Tire grooving machine cuts new treads in rubber in five minutes.

Mechanical Ballot to

Pulling overhead lever on voting machine closes curtain for privacy.

Pulling party lever registers vote. Close-up view of voting levers.

Hoover or Roosevelt—which will be our next president? Millions of voters will cast their ballots in November on a new ingenious machine which will baffle crooked voters and minimize the delay in learning who has been elected. Here is told the fascinating story of this machine and of its forebears devised by inventors of ancient times.

TRULY, magic-working mechanical wizardry shall select the next president of the United States, as millions of voters march to the election booth in November to cast their ballots.

"50,000,000 Votes for President!" is the popular slogan. Thanks to the genius of the engineer, who has perfected voting machinery of marvelous accuracy and precision, it is now possible to tabulate the greatest popular vote in history, announce the result and flash the news to the remotest hamlet in less than sixty minutes after the polls close.

Ancient Methods of Voting

For countless centuries man sought to devise some method of quickly and accurately counting the votes of the people. During this long struggle to cause the voice of the people to be heard, many methods have been used in voting—by acclamation, by markings on paper or leaves, and by stones and pebbles, until our own day, when the perfected voting machine has been adopted by the large centers of population.

In the powerful republic of Athens, decisions were rendered by secret ballot. Two ballots were given each voter—two

This reproduction of priceless old drawing illustrates method of balloting in Venice in the 16th century. Small pebbles were placed in the urns to register votes for one candidate or the other or for some proposed governmental scheme.

Elect Next President

by

EARLE W. GAGE

beans, metal disks, or black and white pebbles. Thus originated the modern "black ball." Two urns were placed on a table—the master urn of brass or copper, and the other of wood. Into the latter were cast lesser ballots. The voting completed, the tokens were spilled on the table and the votes counted. This is the earliest known occasion for "spilling the beans."

In 139 B. C. the first written ballot was introduced into Rome, the great discovery which the ancient world handed down to the present, to blaze the way to political freedom. During this long and romantic struggle to permit the people to decide the fate of government by secret ballot, several men of inventive minds sought to perfect some sure, fair, infallible method of voting and vote counting by means of a machine which would work automatically, be foolproof and withstand the tampering of those who might seek to "swing an election."

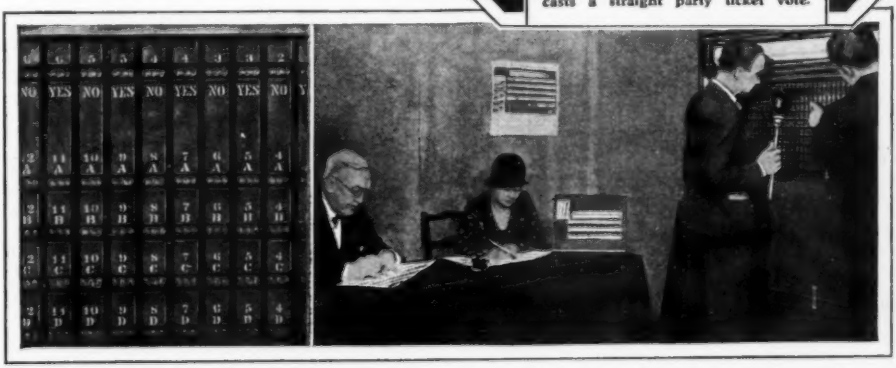
Edison Pioneer Inventor of Voting Machines

Thomas A. Edison was a pioneer in this field. On June 1, 1869, the first patent for which he had ever applied and for his first invention, was granted. This pioneer of voting machines, Edison perfected with the hope that it might be used in Congress, permitting several hundred members to cast a ballot in not to exceed two minutes. But it was rejected, and was Edison's only non-commercial and unsuccessful invention, though the idea blazed the way to the ultimate perfection of the present voting machine.

In 1896 Daniel Davis and Etna H. Davis, of Elmira, New York, patented a voting machine which is shown in an accompanying drawing. The first voting machine built and actually used in an election, however, was the Myers machine, invented by Jacob Myers, and was used at Lockport,

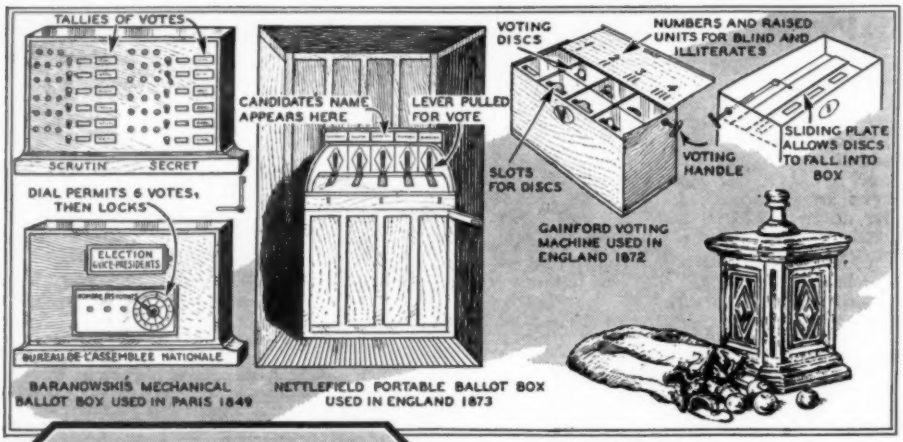
Voter splits ticket by turning down lever over the candidate's name.

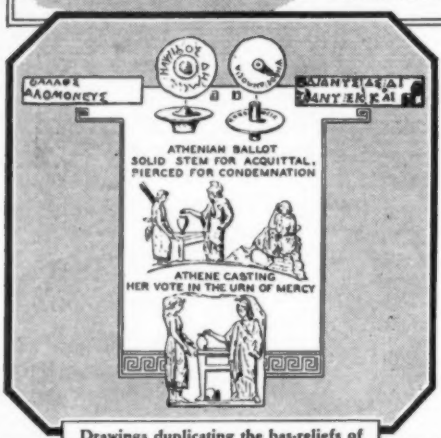
By pulling levers at right the voter casts a straight party ticket vote.



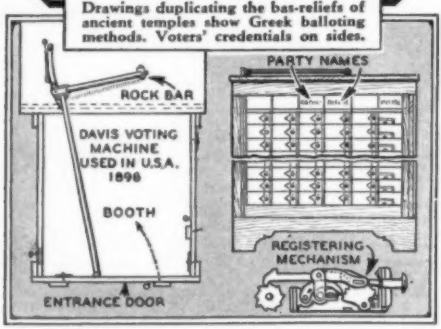
At left is seen how mechanical counting devices on back of voting machine compute the total votes cast for candidates and questions. Right—Election officials tabulating the vote cast. Results are dispatched immediately to vote tabulating centers.

Edison Developed Mechanical Ballot in 1869, Rejected by U. S. Senate


TALLIES OF VOTES
SCRUTIN SECRET
DIAL PERMITS 6 VOTES, THEN LOCKS
ELECTION VICE-PRESIDENTS
BUREAU DE L'ASSEMBLEE NATIONALE
BARANOWSKI'S MECHANICAL BALLOT BOX USED IN PARIS 1849
CANDIDATE'S NAME APPEARS HERE
LEVER PULLED FOR VOTE
NETTLEFIELD PORTABLE BALLOT BOX USED IN ENGLAND 1873
VOTING DISCS
SLOTS FOR DISCS
NUMBERS AND RAISED UNITS FOR BLIND AND ILLITERATES
VOTING HANDLE
SLIDING PLATE ALLOWS DISCS TO FALL INTO BOX
GAINFORD VOTING MACHINE USED IN ENGLAND 1872



Drawings duplicating the bas-reliefs of ancient temples show Greek balloting methods. Voters' credentials on sides.



Seeking to eliminate fraudulent voting inventor perfected this mechanical ballot. Drawing from patent record of 1896.

New York. So successful became this machine that it was widely adopted, to be improved upon by S. E. Davis and A. J. Gillespie, and thus blossomed into the present day voting machine.

This machine, seen on the first two

Here are illustrated some of the French and English balloting machines devised by inventors of the past to prevent crooked voting and speed election returns. In lower right hand corner is seen ancient ballot box and balls used by people on the Isle of Wight to elect rulers.

pages of this article, has an upright keyboard, on which are rows of keys, each of which represents a party candidate, arranged in horizontal lines across the face of the machine. At the left of each party row is a lever which, pulled down, may be used to vote a "Straight Ticket." Or, the keys may be moved separately to a voting position, to vote for any desired candidate in any party row.

In order to obtain and maintain secrecy, before the voter can cast his ballot he enters the booth and pulls a lever over against the face of the machine which closes a pair of curtains around him, thus preventing anyone from knowing how he votes.

How Mechanical Ballots Are Cast

In voting, he pulls either a party lever for a straight ticket, or a candidate's lever to vote independently. As each voter makes his egress, the votes cast are automatically added to the total already recorded by voters that preceded him.

Thus, when the polls close only the total vote for each candidate appears, leaving no identifying marks, disclosing how any voter has voted.

Each voting machine is in charge of an official, and is equipped with lockout devices which are operated to prevent particular voters from voting for offices or on questions on which they are not entitled to vote.

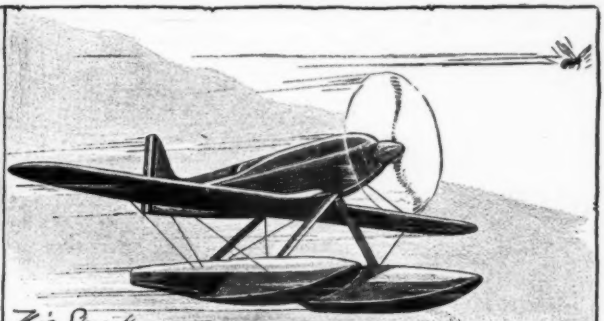
Just back of the rows of keys is located the counter compartment which contains the registering devices for each candidate. The automatic recording feature of the voting machine, as in various other calculating contrivances, assures an immediate compilation of the authentic results as soon as the polls close.

(Continued on page 148)

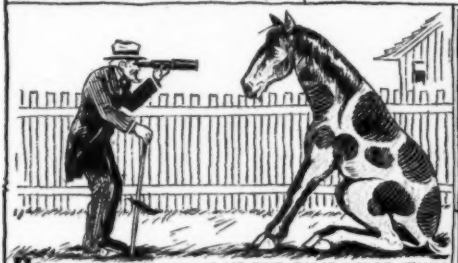
Oddities of SCIENCE

by NIC SPRANK

A CURRENT OF ELECTRICITY WILL FLOW FOR HOURS THROUGH A COIL OF LEAD IMMERSED IN LIQUID HELIUM, WITH NO EXTRANEOUS SOURCE OF CURRENT.—*Richard Paul, Norwood, Penn.*



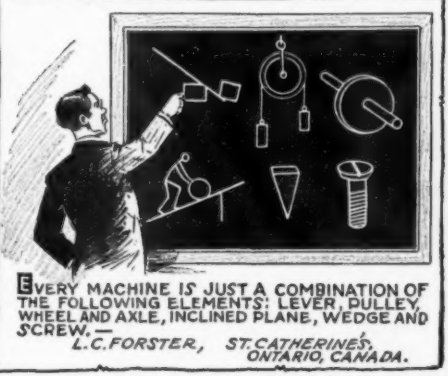
INSECTS CAN TRAVEL TWICE AS FAST AS THE HIGHEST MECHANICAL SPEED ATTAINED BY MAN. (*The South American deerfly has been timed at 815 miles an hour.*)—*Clair Roberts, Bengough, Sask.*



A HORSE NEVER GROWS UP THE SAME COLOR IT WAS BORN (*A dapple gray is born black; a black horse invariably has some lighter color as a colt.*)—*Alex Hougum, Auburndale, Wis.*

THE POWER EXERTED BY A FLY CLIMBING ONE INCH IS EQUAL TO THE POWER PICKED UP IN NEW YORK BY RADIO FROM A CALIFORNIA BROAD CASTING-STATION DURING A CONTINOUS PERIOD OF 35 YEARS.—*Julius I. Pinus, Albany, Oregon.*

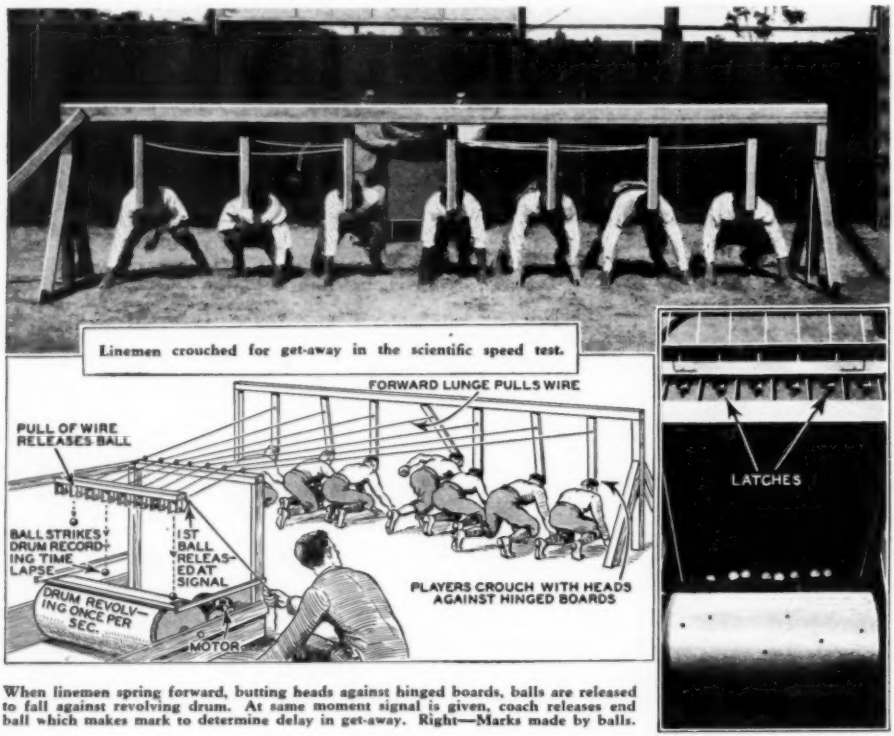
WATER AT HIGH VELOCITY BEHAVES LIKE A SOLID AND CANNOT BE CUT THROUGH WITH AN AXE —*P. GRAHAM, CAPE TOWN, S. AFRICA.*



EVERY MACHINE IS JUST A COMBINATION OF THE FOLLOWING ELEMENTS: LEVER, PULLEY, WHEEL AND AXLE, INCLINED PLANE, WEDGE AND SCREW.—*L. C. FORSTER, ST. CATHERINES, ONTARIO, CANADA.*

ONE DOLLAR will be paid by Nic Sprank for oddities of science used on this page. Send in your ideas—no limit to the number of suggestions you may make, but be sure to enclose proof of your statements. Maybe your ideas will be better than those shown on this page—if they are, Nic Sprank wants them and will be glad to send you a check. Address suggestions to Nic Sprank, care of Modern Mechanix and Inventions, 529 South Seventh Street, Minneapolis, Minn.

GOLF BALL GAUGE *Picks*


Linemen crouched for get-away in the scientific speed test.
FORWARD LUNGE PULLS WIRE
PULL OF WIRE RELEASES BALL
BALL STRIKES DRUM RECORDING TIME LAPSE
1ST BALL RELEASED AT SIGNAL
DRUM REVOLVING ONCE PER SEC.
MOTOR
PLAYERS CROUCH WITH HEADS AGAINST HINGED BOARDS
LATCHES

When linemen spring forward, butting heads against hinged boards, balls are released to fall against revolving drum. At same moment signal is given, coach releases end ball which makes mark to determine delay in get-away. Right—Marks made by balls.

HOW do coaches know they have picked the fastest candidates for the college football teams?

The fact is, they don't. They can only make a rough guess at a player's ability.

It has remained for a scientist at Stanford University to determine within a split second, within a thousandth of a second, to be precise, just how fast a player actually is, whether he's placed in the right position, and whether he should be on the subs or the varsity.

Psychologist Develops Timing Machine

Dr. Walter R. Miles, who settled the question of football superiority once and for all, and who is one of the world's best known psychologists, performed this football miracle with seven golf balls and a fence-like apparatus which permitted the player to lunge forward as if he were bucking the line in a game.

The players, tested in groups of seven, crouched with their heads against a row of hinged boards, as illustrated in the photo at the top of the page. To these hinged boards were attached, about a third of the way down, heavy cords or wires leading to a strange looking machine in the rear.

It was this machine which told the story. Each wire from the hinged boards was connected to a latch which released a lampblacked golf ball when the wire was pulled; that is, when the player lunged forward. Now underneath the row of golf ball compartments and their respective latches, there was a cylinder revolving at the rate of once a second. The golf ball on its way earthward thus would strike this cylinder and impress a black mark on it, telling just how quick the player was on the get-away.

Machine Makes Group Test

In conducting the test, the coach gave the signal "Hike!" and the seven players sprang forward, releasing the golf balls to fall against the cylinder. The speeds of the players were then recorded by the difference between the marks they made on the graph paper and the mark made by the ball released by the coach as he uttered the starting signal.

This method of measuring reaction time has been worked in laboratories with individuals, but never before with seven persons together. And it has revealed some

Fastest FOOTBALL Players

astounding facts about football players, coaches and officials.

"By these tests," Dr. Miles says, "we are able to determine players' speeds quicker than a coach can judge them. Football players have difficult parts to play and the situation is never the same in different games. Coaches learn to know their men, yet we can know them earlier by means of such laboratory tests. In fact, this is a good way to avoid favoritism."

Dr. Miles learned, by repeating tests several days, that fastest players ordinarily remain the fastest, that good players become better by constant practice, that stars on the Stanford "varsity" squad are only 28/1000 of a second faster than the average for the entire squad. How little difference between a star and an ordinary player!

But speed in play avails a team nothing if it can't be synchronized into a machine consisting of 11 parts. How can this best be accomplished? Dr. Miles found by testing seven players simultaneously with different types of signals that they get away with a faster, harder charge if they "hike" on the fourth number called, while the quarterback shouts the numbers at the rate of 100 a minute!

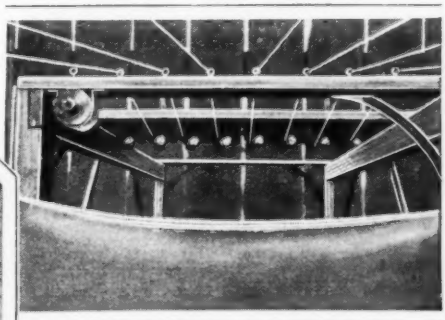
Starting numbers placed later or earlier in the series caused a good many offsides.

Oddly, the machine revealed also that officials see very few offsides. The golf balls, in one series of tests, recorded 188 offsides. An experienced official called 78, and 20 of these were incorrect!

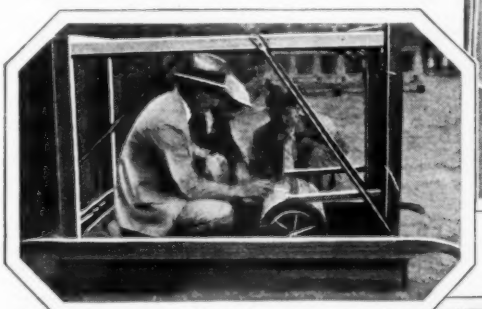
The ideal method of play, the apparatus revealed, calls for a method of signal calling wherein the players can anticipate the signals, and the signals should be called between two and five seconds after the team gets set.

The speed of a player on the get-away depends upon the rapidity with which his reflex actions operate. The signal "hike!" is received by the ear, and transmitted over the auricular nerves to the brain. The brain upon receiving the signal in turn transmits a message of command to the arm and leg muscles, causing the player to spring forward.

In some players these messages from ear to brain and commands from brain to muscle travel at higher speed than in others.

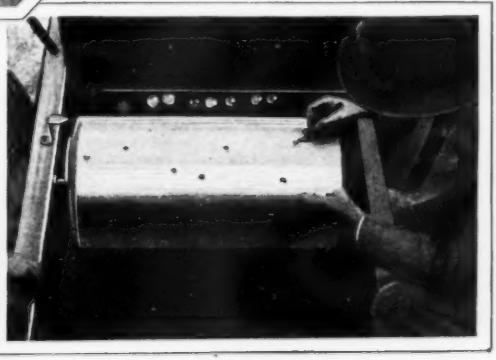


Here you see the battery of eight latches with golf balls in place ready to fall and record the signal and reaction of the seven players undergoing the tests.



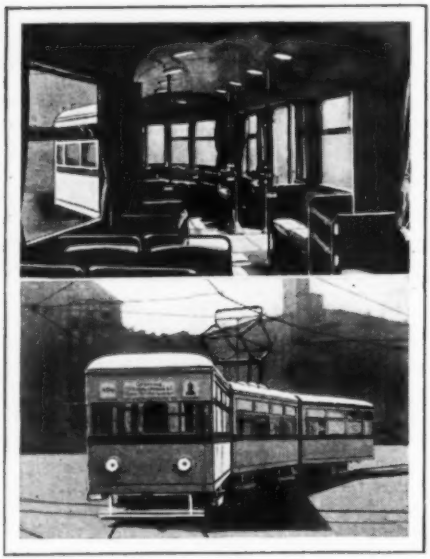
Dr. Miles, inventor, with coaches looking over apparatus for measuring speed of football players.

Dr. Miles is seen in this photo marking the starting point on the rotary drum to determine delay of players in getting into action after the proper signal.



These seven tell-tale marks made on the revolving drum by the golf balls indicate the difference in charging speed of the Stanford varsity line. Coaches know precisely who are fastest men.

Articulated Trolley Car Bends Around Street Curves

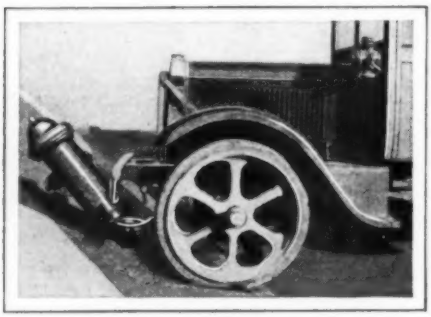


This articulated street car, which is to be seen wending its serpentine way about Berlin's streets, has joints like pullman.

Fire Hydrant Has Collision Joint

OF ESPECIAL interest to fire department chiefs and municipal officials is a new fireplug which minimizes the dangers incurred by the impact of run-away trucks. When struck the hydrant breaks off cleanly along a special groove which connects the top section with the ground pipe. After the accident the dislodged section can be put back into service within half an hour without making excavations.

The distinguishing feature of the hydrant is its division into two sections, which abut each other several inches above the ground. After the accident the only parts that need to be renewed are the breaking ring and stem coupling.



When struck by run-away truck, this "Safetop" fire hydrant breaks off at special joint. Repairs may be quickly made.

THREE-IN-ONE street cars may be seen wending their serpentine trails about the streets of Berlin, Germany, these days.

What necessitated the introduction of this innovation in trolley cars was the need for the speedier transportation of increasing swarms of passengers. The car has three sections, each of which is joined by a flexible hood much in the manner of our American pullmans.

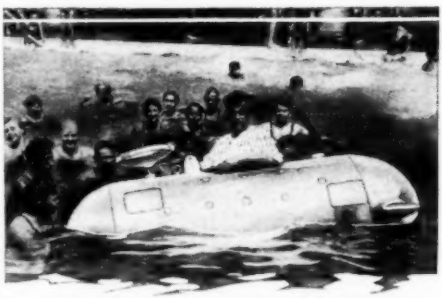
With an entrance in each section, passengers can embark and debark with utmost dispatch, while four motors, each operating on a separate axle, afford quick starting. Connections with the overhead trolley is made in the usual manner, only one contact being necessary.

Sub Safety Device Submerges 1 hr.

DESPITE innumerable safety devices which have been introduced in the last few years to afford a safe and certain means of rescuing crews of stricken subs, the navy still issues its standing request for *the* safety device.

Latest to take up the challenge is Menotti Nanni, who has developed the rescue chamber shown in the photo below. Details of the contrivance are not available, but it is known that it proved itself capable of providing a high degree of safety.

By way of putting the device through a severe test, it was submerged for an hour in Luna Park swimming pool, Coney Island, where it drew a crowd of curious spectators.



Menotti Nanni coming up for air after being submerged for hour in submarine escape chamber of his own invention.

New Theory Why We Grow Old

WHY a living bath sponge never grows old or dies while other creatures such as men inevitably must do both, was explained to the recent session of the British Medical Association. The secret is that the bath sponge can keep on growing forever, while human beings have natural mechanisms which limit them to certain definite sizes.

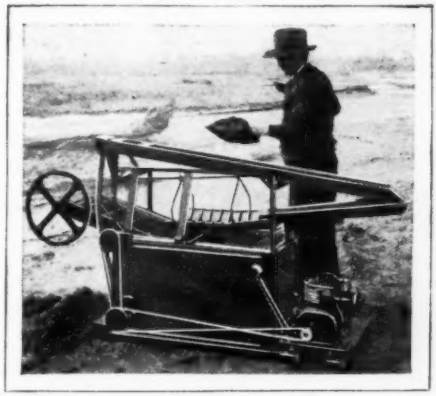
Among lowly creatures like sponges this unlimited growth does no harm since sponges never move.

Motor Driven Panner Aids Small-Scale Placer Miners

A NEW gold cleaning device has been put on the market to wash gold from the gravel of western streams. Water is pumped by a small gasoline engine which uses only a gallon of fuel in eight hours; and the same engine oscillates a pan provided with riffles to catch the gold and the heavy black sand usually associated with it.

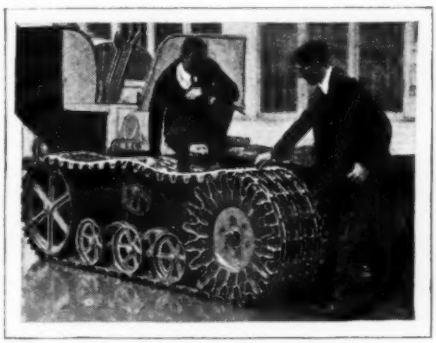
Operated by one man, the machine handles a cubic yard of gravel an hour and the pan is quickly removed for cleaning every twenty minutes. A small conveyor dewaters the tailings automatically, and the water remains in the tank to be used over and over again.

Another feature appealing to the modern prospector or placer miner is that the whole machine with the exception of the motor packs up in its own tank and may be carried on the rear seat of an automobile.



Ideal for small-scale placer mining, this new mechanical panner is powered by gas motor which pumps water and oscillates sifting pan. Machine may be carried on auto seat.

Tractor Treads for Muddy Terrain



New tractor tread, with segments connected by flexible cable, negotiates roughest terrain with utmost ease. Unusual width gives superior traction for travel through mud.

WHERE excessively muddy roads and heavy going are to be encountered, a new tractor tread having an unusually large traction surface proves ideal. Greater width and higher flexibility account for the superior gripping power of the tread, which has its series of segments joined by heavy cables. Shown in the photo above, the tread negotiates the most irregular terrain, yet will do no damage to the most fragilly paved street.

Men Have More Colds Than Women

WOMEN are less likely to catch colds than men are, if men and women students at the University of Michigan since 1917 can be taken as typical. Each year from 500 to 900 men students in each thousand of student population have been treated for colds, mild influenza, etc. Meanwhile the average number of women students treated for the same disease has been consistently five per cent to thirty per cent lower than the number of men students.

Swim Belt Has Twin Tube Floats

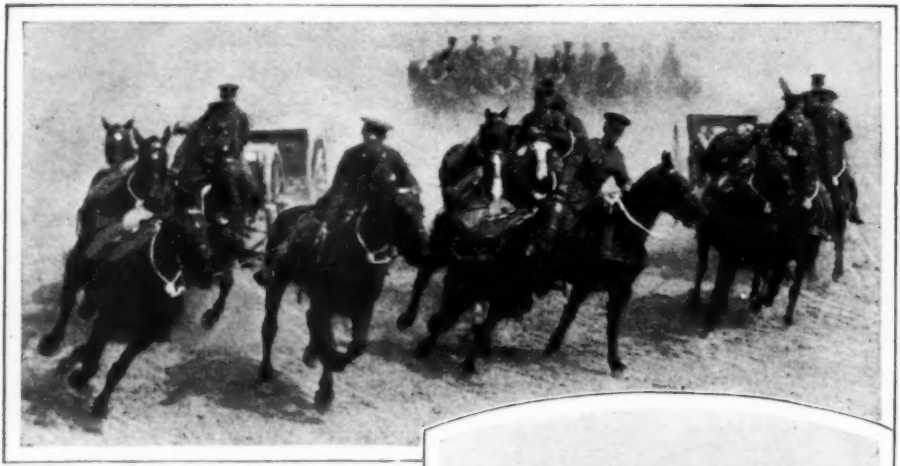
A NEW departure in the way of water wings is represented in a life-belt, now being marketed, which consists of two rubber tubes worn comfortably over the shoulders as illustrated in the photo below.

Designed primarily as an aid in learning to swim, the device may also find service among amateur canoeists, surf board riders, sail and motor boat racers, and others who may be subjected at moments to the perils of deep water.

The two rubber tubes, which form the float portion of the device, are riveted to a belt which is fastened around the waist of the wearer. A band connects the two tubes at the back to hold them together.

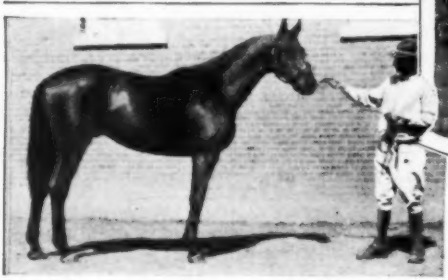
Ample freedom of movement along with high degree of buoyancy is provided with new swimming wings, consisting of twin rubber tubes riveted to belt worn around waist.

Why Modern Armies Still



Black horse battery "B," 16th Field Artillery at Fort Meyer, Va., demonstrating the high maneuverability of which the horse is capable under the heaviest fire —an indispensable quality in modern warfare.

Typical cavalry horses ready for inspection at Fort Meyer.



Horses like the remount Stallion, "Fitzgibbon," shown above, in service at Fort Robinson, Nebraska, prove ideal cavalry animals. They are capable of packing heavy weights on forced marches and possess unusual courage, stamina and recuperative ability—all thoroughbred qualities.

by **M. W. MEIER**

YOU may not know it but Uncle Sam has the finest cavalry on earth—pitifully small though it is.

It may lack the swank, color and picturesqueness of that of other nations but what it may lack in fancy-drilling ability it more than makes up for in equipment, firing-power and maneuverability—the things that really count in war.

First organized in 1832 as a branch of the regular army, our cavalry has had an even century of actual fighting experience from which it has profited much. Never a lance-toting outfit, it has concentrated on firing-power and destructiveness and in this respect, exceeds any other branch of the service; likewise any other nation.

From bitter knowledge gained in the Mexican, Civil, Indian and World wars, our cavalry has evolved its own peculiar tactics which are as unlike those of other nations as day is night. In the words of an army officer: "To visualize them in action you must forget the pictures you have seen on the Charge of the Light Brigade or the Scotch Greys." They are trained to fight mounted or afoot and their equipment enables them to batter through men, tanks or aircraft.

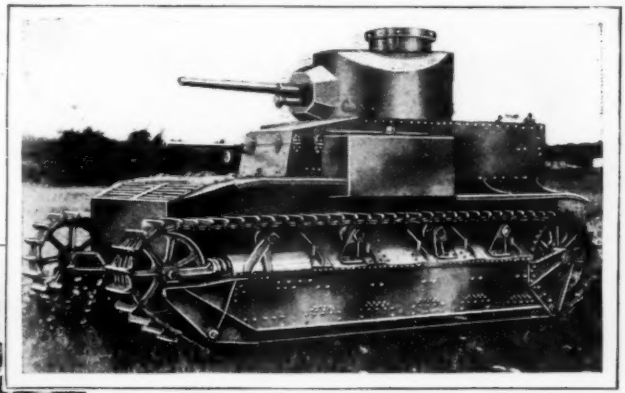
Rumors of Doom of Horse Groundless

When the War Department announced in mid-1931 that one of its fourteen cavalry divisions was about to be mechanized and equipped with tanks and armored cars, a hasty ill-informed press heralded the news that the horse was doomed in war and that only sentiment still kept him in the army.

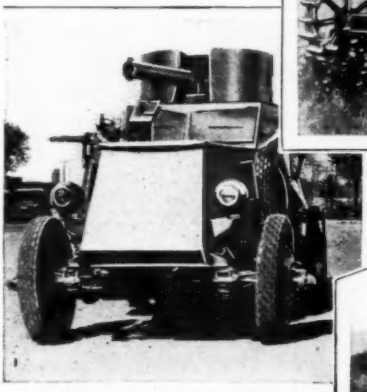
Nothing was farther from the truth. However horrible future wars may be—titantic combats involving fearful engines of destruction, lethal gases and mighty ar-

CLING to the CAVALRY

The tank is a powerful weapon, but the faithful horse can still outfight it in many situations encountered on modern battlefields. Here is told the cavalry's side of the story.



Although highly effective in trench warfare, the army's standard medium tank proves a slow-moving piece of fighting equipment on rough terrain, which the horse usually negotiates at high speed.



In maneuverability these armored cars, which form the "mechanized cavalry," approach the horse, but powerful tank guns can render them inoperative with a few well-placed shots. The necessity for constant re-fueling also acts as a handicap.

For covering vast expanses of rough country, such as is found along the Mexican border, the horse proves an ideal means of transportation for troopers who are compelled to engage in sporadic combats with guerilla bandits.

tillery—man's best friend, the horse, is sure to play his part in them.

His value is too clearly established to ever be utterly eliminated by push-buttons and motors. In a highly-mechanized age, his mobility and usefulness seem destined never to be matched.

To him goes no little of the credit for winning the late World War. His strength and dumb-willingness have been deciding factors in every major land battle for thousands of years. Since history began, he has played his part with man and shared his victories and defeats.

Tank Hasn't Adaptability of Horse

The answer to the argument as to whether the horse is doomed in future wars is really a simple one—he will be indispensable in battle until they are solely fought from pavements, water or in the air!

Motors, however perfected, can never equal the mobility of the horse in cross-country terrain; can never swim rivers, climb mountains and traverse swampy areas regardless of weather and seasons.

He is still the "eyes, ears and muscle" of armies and will be so until airplanes can see by night and motors are built to do the impossible. Until then, all mechanized forces are but helpful adjuncts to man—and the horse.

The power of an army depends on its mobility. It must quickly reach strategic positions, regardless of railroads, highways and difficult terrain. Once there, it must combine superior generalship with firing-power, shock and movement and be equally facile at attack or defense.

Say what you will, only highly-organized and equipped cavalry can possess all these advantages and beside them, all the death-dealing machinery in the world can only be regarded as helpful auxiliaries.

Mechanized forces are lovely things to conjecture over but in warfare their very

Hauling loads of ammunition was a task at which the mule proved himself a master in the World War, where hardihood was demanded.

Arabian horses have been consistent winners in army endurance rides. Above is shown "Crabbet," a prize winning Arabian. Carrying 245 lbs., he covered 300 miles in 49 hrs.

"Beauty Itself," one of the most amazing American fillies ever bred. Such horses are too valuable for cavalry use, their chief purpose being to improve the cavalry stock.

immobility defeats them. They are unwieldy, difficult to control and extremely vulnerable in rough terrain. Fuel is ever a problem.

The vaunted tank was invented as the "cure" for German machine guns and trench warfare. It had its one big day but after that, the Germans were ready for it. Of the 415 that went into action at Amiens, August, 1918, only 67 returned to base. All the others had been put out of action.

One Cavalryman Can Demolish Tank

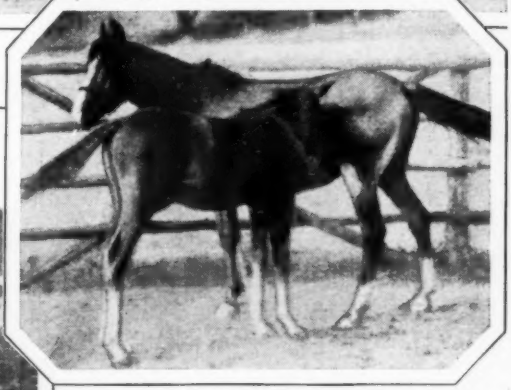
England has spent hundreds of millions experimenting with tanks. The cheapest decent model costs around $40,000 to produce. But one cavalryman, hidden behind a tree, sandbag or metal shield, can reduce it to a mass of worthless junk in thirty seconds, using a gun which costs only a few hundred dollars!

Our troopers are all equipped with automatic rifles and machine guns before which no tank or armored car can stand. We have developed a simple anti-tank gun which fires 400 rounds to the minute. It can be packed or unpacked in split minutes and is readily loaded on a horse's back.

We have other automatic weapons that range from the hard-hitting .45 automatic pistol to 37 mm. caliber. This last-mentioned wicked weapon weighs 209 pounds complete and is easily packed on a single horse. It takes 31 seconds to unpack and assemble and 13 shots can be fired per minute at a moving target. In recent tests, this "little" result-producer readily pierced ⅝" steel boiler plate at 550 yards. Not so good for enemy tanks!

Airplanes and dirigibles are doughty

The horse has a monopoly on the job of transporting light artillery over rough terrain, as demonstrated here. Shell-battered roads are no handicap.



A pure bred Arabian mare with foal. The colt will easily bring $1500 when 1 year old.

The horse proves an unusually intelligent pupil at learning to obey orders. Above, Mrs. Ruby Hughes, of Phokee, Fla., is exhibiting her trained equine at a charity carnival.

weapons to cope with but man's inventive genius has devised nullifying instruments that so far offset their every advantage. "Dog-fights" and sporadic bombing can scarcely determine a war and far distant is the time when every soldier will fly. Until then a dismounted cavalryman or two, operating a special aircraft rapid-fire gun can hold their own. They can rain *up* .30s, .50s and 37 mms. to their heart's content.

All this is not to belittle the value of mechanized force in warfare. Rather it is to help point out its definite limitations. Once that point is reached, man-power and horse-flesh must carry on. Machines of war can only be adjuncts to their superior flexibility.

Both the Boer and World wars were striking examples of the value of the horse. The Boer conflict lasted as long as it did because De Wet's 2700 illy-equipped troopers happened to be mounted on tough little horses of half-Arabian and native stock. These mostly survived the war as compared to England's horse casualties of 400,000. This nearly exhausted their stock and not until they bought a hundred thousand of our hardy Western cow ponies were they able to outride the Boers.

Horse Played Notable Role in World War

The World War was largely a trench affair but horses played a noteworthy part. They not only fought and died but their carcasses were immediately consumed for food. In his splendid article on the history of our cavalry in Our Army Magazine, for June, 1931, Major-General Henry, Chief of Cavalry, U. S. A., quotes three allied gen-

erals on their need for cavalry during 1918.

Lt. Gen. Liggett, who commanded our own 1st Army, is quoted as wishing for a couple of divisions of cavalry *trained* as *our* own cavalry is trained. "Had these been available I do not think any organized enemy force could have crossed the Meuse and captures in material would have been much greater."

In 1918, a small force of French cavalry successfully blocked the retreat of the Bulgarian army, resulting in the surrender of 90,000 men and the total withdrawal of Bulgaria from the war.

British Horses Defeated Turks

General Allenby's campaigns against the Turks were chiefly cavalry engagements and to their success is traced the defeat of Turkey. Italian cavalry on the Piave River in the great Vitorio-Veneto battle, completed the destruction and surrender of 1,200,000 Austrians—a movement which ended that country's participation.

If war were to break out tomorrow, the problem of adequate horseflesh would be a terrific one. The cavalry isn't the only branch where horses are needed. The artillery, quartermaster-supply, medical and even infantry divisions must have their quotas to carry on.

Horse of Future a Better Animal

Experts figure that by 1940 there will be a total of less than ten million of both horses and mules in this country. BUT—those ten million will be far superior animals than we possess today!

They will be *better* because of a unique branch of the army known as the U. S. Remount Service which has for its chief purpose the improvement of horses throughout the United States and possessions.

The work of the Remount Service is so amazing and useful that every reader of MODERN MECHANIX AND INVENTIONS ought to know about it. Today, that organization handles 730 government-owned stallions and a most conservative estimate of the foals produced by the plan is set at $10,500,000 to offset a total cost to taxpayers during the decade, of $1,500,000. At no cost to the army, a reserve of 100,000 fine horses has been created which would be available in case of war.

Remount Stallions Available to Farmers

Remount stallions are at present available to farmers and horse-breeders in 39 different states and both Hawaii and Porto Rico. Stallions are sent to areas at government expense and placed in the hands of reliable individuals. Government stallions are supervised from Remount bureaus located in five zones—Lexington, Ky., Fort Reno, Okla., Kansas City, Mo., Colorado Springs, Colo., and Fort Douglas, Utah. If you want any information any of these posts will gladly answer you.

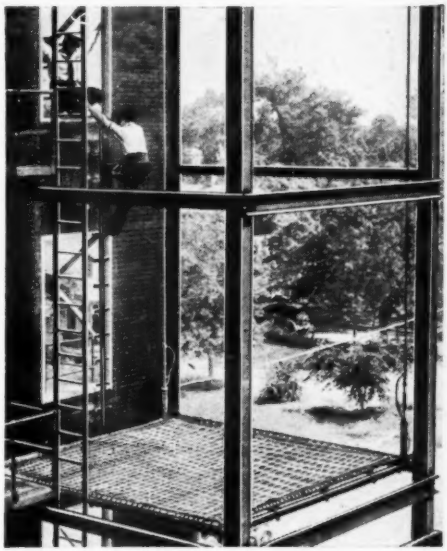
In addition to these bureaus, the remount operates three depots where breeding experiments are carried on and stallions conditioned. These depots are located at Front Royal, Va., Fort Reno, Okla., and Fort Robinson, Neb.

Army's standard light tank is shown ascending a steep hill in maneuvers.

"Faviba Girl," by Borbous Beau out of Lady Chemist, and her proud foal—members of the upper crust of horsedom.

Death to Rookie Firemen Prevented by New Safety Net

HUNDREDS of recruit firemen have lost their lives during their rookie days due to the perils involved in learning their profession. To overcome this hazard the fire department of Wichita, Kansas, has constructed at one of its stations a safety life net in connection with one of the practice towers. The device, seen at the right, consists of a safety life net which may be raised and lowered much as an elevator and which follows the recruit up and down the practice tower whether he be learning wall scaling, rescue work or the running of a hose line. This device has done much to speed up the practice of recruits since its recent installation.

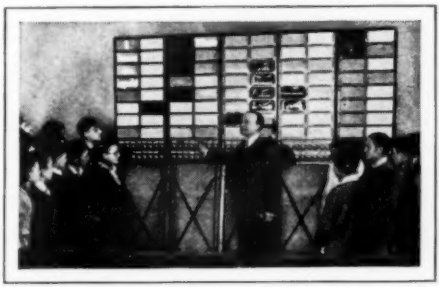


To prevent loss of life by recruits learning to fight fires, Wichita, Kansas, fire department has built this safety life net which catches novice if he misses rung on ladder.

Machine Translates 1000 Words

MACHINES can do almost everything but actually think, and a mechanism recently devised by a French language teacher almost does that, for it can translate one thousand words of French into English and vice versa.

The mechanical translator employed in teaching conversational English to Paris police, is seen below. On it is written an English statement, and on the various panels appear questions about this statement. Pressing a button marked in both English and French flashes on the questions and their interpretation.



French to English words appear translated on this board at pressure of button. I have appointment, says the board. Where, it then asks.

Science Seeks 'Lemuria' Under Sea

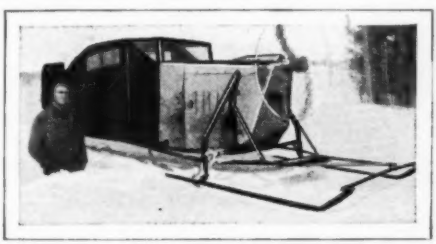
A SEARCH for the supposed vanished continent of "Lemuria," imagined by some geologists once to have existed in what is now the Indian Ocean like the fancied continent of Atlantis, is to be made next year by a scientific expedition. From studies of animals which have lived in past ages on the borders of the Indian Ocean, geologists deduce the former existence of the Lemurian continent, now believed to be sunk —a scientific theory perhaps responsible for the popular ideas of the vanished Pacific continent of Mu, although the sinking of Lemuria, if it happened at all, is dated long before the age of man.

Eskimo Taxi Navigates Snow Drifts

AN "Eskimo Taxi," or snow plane, that will negotiate with utmost ease the highest drifts and deepest snow, speeding along in the manner of a launch breasting a choppy sea, is the invention of Harold Emigh, of Walden, Colorado, where snow sometimes falls with a vengeance.

The plane will hit off a clip equal to that of the fastest car, and yet it can idle along at only a mile an hour. In winter, when the roads are snow-blocked, Emigh's machine is the only available means of transportation.

The controls are a steering wheel, foot throttle and brake. Empty, the ship weighs 775 pounds, including 95 h.p. airplane motor. Passengers travel comfortably in the heated 3 place cabin, whose roof stands 5 feet above the ground.



Powered by 95 h.p. plane motor, this "Eskimo taxi" negotiates highest snow drifts with ease of launch in choppy sea.

Grocer Builds "X-ray" to Sell Customers Flawless Spuds

Potato X-ray, operating much like an egg candler, quickly detects flaws in spuds. Light adequate to penetrate the potatoes is furnished by a 1000 candle power light, intensified by mirrors. Potatoes are viewed through elliptical holes.

WHAT is more embarrassing to a housewife who boasts of her cooking than to have her mashed potatoes turn out black, or to have her guest slice into a deliciously baked cobbler and find it with a black cavity?

Confronted with complaints from housewives on bad potatoes, an Ames, Iowa, groceryman rigged up a potato X-ray, or candling device to inspect choice potatoes before they go to the fastidious customer.

This groceryman's invention, modeled after an egg candler, is a wooden box with two elliptical holes cut in the top. Light adequate to penetrate the spuds, and thus disclose the flaws, is furnished by a 1000 candle power lamp set in the bottom of the box.

Mirrors sloping outward from the light socket to the top of the box serve to increase the reflection. The potatoes must be examined in a darkened room.

Now when there is need for unblemished potatoes for the luncheon, banquet, or party, housewives of Ames, Iowa, go to the one grocer they know can be depended upon to furnish exactly what is wanted. If the customer wishes, she can do her own inspecting—that's a privilege which the grocer permits them in his store.

Hot Water From Waste Lamp Heat

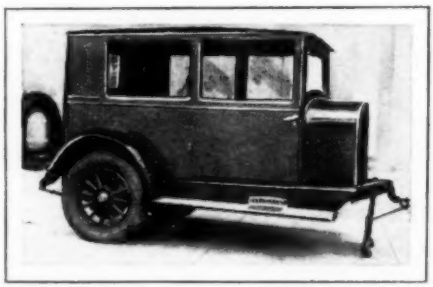
ILLUMINATION engineers are well aware of the deplorable fact that no device wastes energy like an electric light. Only 4 to 5 per cent of the "juice" is transformed into light, the remaining 95 per cent being wasted in useless radiant heat.

Now comes a Swiss engineer with an invention which puts the wasted energy to useful work. He makes the radiant heat operate a midget water boiler built around the bulb, as illustrated in the photo below.

The glass boiler encasing the bulb holds about a quart, which may be brought to a boiling point in 40 minutes.

Glass boiler encasing light bulb utilizes waste heat from the light bulb. Water is brought to boiling point in forty minutes and is drained off for washing through stopcock.

Make Trailer From Defunct Auto



With front portion of auto cut off at dashboard, old auto body makes serviceable trailer to carry extra passengers.

OLD automobile bodies that have been consigned to the junkyard can still do a lot of good in the world, for they can be pressed into service as very substantial trailers.

The chief operation you will have to perform on the auto is the cutting off of the front at about the point of the dashboard. This disposes of the motor and its weight. You can easily contrive your own coupling. In the photo above the side members of the chassis are bent in, to form a V, at the point of which is attached the coupler.

Of course, weight should be reduced to a minimum. Strip the machine down to its essentials, and you'll have accommodations for extra passengers and luggage when you go camping.

Chicken Feed Shocked From Earth With "Worm Wands"

PATROLMAN Walter O. Lickert, of Omaha, Nebraska, whose flock of chickens numbers 13,000, is materially lowering the cost of his feed bill by the development of what he calls his "electrical worm extractor," or "worm wands."

To a pair of bicycle pump handles sixteen inches long, Mr. Lickert wired electrical connections below the handles, as illustrated at the right. Twenty-five feet or so of cord and a plug into an electric light socket at the house comprise the mechanical equipment. An electric bulb is swung between the wands to show whether current is on or off.

Plunging the wands into the earth up to the handles, which are placed two feet or more apart, Mr. Lickert turns on the "juice." Then the electrical current between the poles brings worms to surface.

This "electrical worm extractor," consisting of two pump rods wired to the 110-volt house currents, shocks up numerous worms out of the ground to feed the chickens.

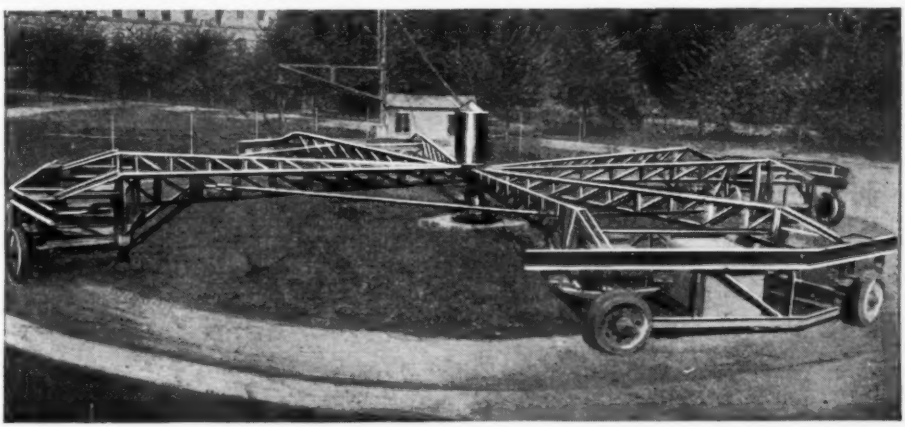
Surgeon Finds Two-appendix Man

A CASE reversing the familiar joke about the surgeon who opens his patient for supposed appendicitis and finds that the appendix already has been cut out by a previous operator, has been reported to a London medical journal. This patient turned out to have two separate and complete appendices, a short distance from each other.

Two-wheeled Chassis Circling 'Round and 'Round, Test Road Materials

A ROAD testing machine constructed of huge steel girders, with eight heavy motor truck wheels forming four two-wheel chassis at the outer edge and driven by one central motor, is being operated daily in Germany in gathering data of the durability of highway materials.

Professor Amann at the Institute for Road Construction at Karlsruhe designed the massive testing apparatus. Various kinds of highway materials are being studied under actual conditions of wear and tear. The material is laid down in a circular strip under the outer edge of the testing machine. Operated by the central motor the huge rollers turn day after day.



Various kinds of materials for highway construction are given thorough-going test under wheels of this "merry-go-round." Four chassis, having each two wheels, and powered by motor at pivotal point, circle around track on which material is laid.

New Inventions Make Life

The balloon tire has found a place with the newest furniture. The chaise lounge, shown above, equipped with small pneumatic tires, is now being widely used in homes and hospitals, where it affords greater comfort to invalids. Tire pump used for inflation.

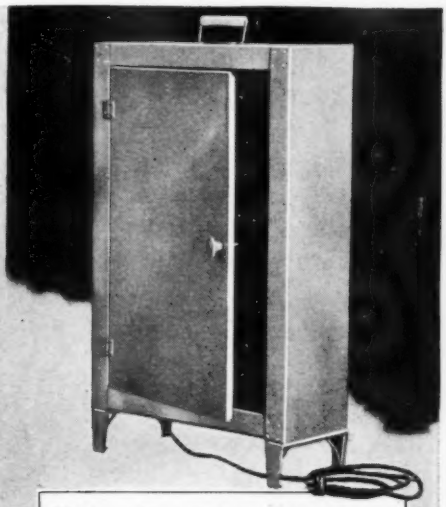
Latest in cooling devices is an electric fan enclosed in metal case. As fan revolves it actuates a rubber belt which agitates water in reservoir, causing fine mist to rise up in front of the fan blades, purifying the air. The device hangs from special wall bracket and swings about in any direction.

Now available on the market is a spring jug handle which takes the place of the broken one, or turns any vessel into a jug. Here is a large cup fitted securely with handle, which can be removed in a second.

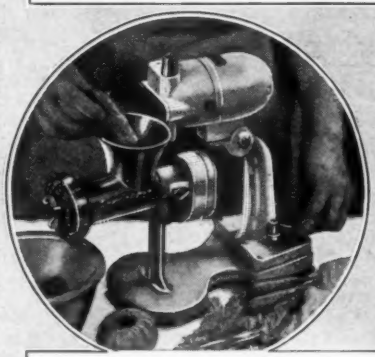
Eliminating the necessity of handling dirt from a vacuum cleaner, an inexpensive bag of filter fiber is now provided with an adaptor for attachment to any standard cleaner. Thrown away when full of dirt.

EASY for the HOUSEWIFE

Ideal for the small apartment is this ultra-midget washing machine mechanism which fits into a special tub to do the thrashing as illustrated in this photo. Note that the motor is built into the top of the machine, where it does its work with greatest economy of space and trouble.

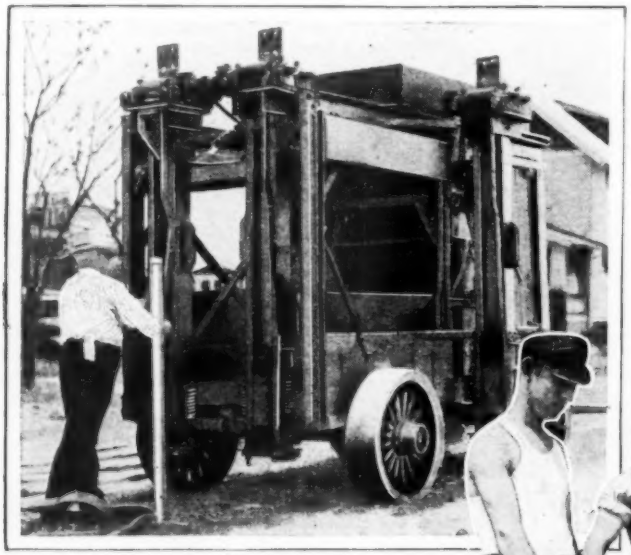


Hand towels, wash cloths, light fabric garments and baby clothes may be dried inside this electrical drying cabinet now on the market. There's not the slightest danger from fire.



Orange juicers and meat grinders operated by an electric motor in the kitchen have long been common. Now a manufacturer comes along with a motor equipped so that it can be used as a juicer, an egg beater or a cream whipper, a meat grinder, a vegetable cutter, a potato masher or even a can opener, as at right. Above—Machine grinding meat.

Modernized CIRCUS Offers



One of the newest mechanical aids to the circus is this high speed stake driver which handles three stakes at a time and can hammer down over three hundred in an hour. The machine spells the doom of picturesque sledge slingers but saves immense amounts of time and labor.

Freak inventions that throw audiences into spasms of laughter, and practical inventions that effect great savings in time and labor—such contrivances are gradually making the circus into a highly modernized spectacle. This unusual article tells of the amazing changes that science has wrought in the circus and throws out hints to inventors.

by WALTER E. BURTON

"AND, ladies and gentlemen, we will present for your entertainment selected acts from all parts of the globe."

These magic words which start things humming under the big top used to issue from the throat of the silk-hatted ringmaster. Now they boom forth from the many-mouthed public address system, one of the mechanical newcomers that has worked its way into the circus world.

True, the ringmaster still sports his silk hat; but he remains silent, letting an announcer and an up-to-date amplifying system do the talking. So apparently the circus is changing.

These are not fat years for circuses, any more than for other kinds of business. Crowds which collect to watch the long train unloaded and the tents go up are still as large, perhaps even larger; but fewer people buy tickets, visit the side show, or get peanuts to feed the elephants.

Circus Turning to Science for Help

Consequently the circus, which has stuck as closely as possible to time-tried ways of doing things, is turning more and more to science and its modern inventions. In fact, it is within the circus itself that many new ideas now being adopted originate. Some

When not busy making children laugh, clowns doff their costumes and become inventors, evolving such complicated and useless devices as the hair cutter at right and the rabbit hatcher in center, from which grown-up bunnies spring. These devices never fail to get a laugh from audiences.

of them are of value outside the canvas city.

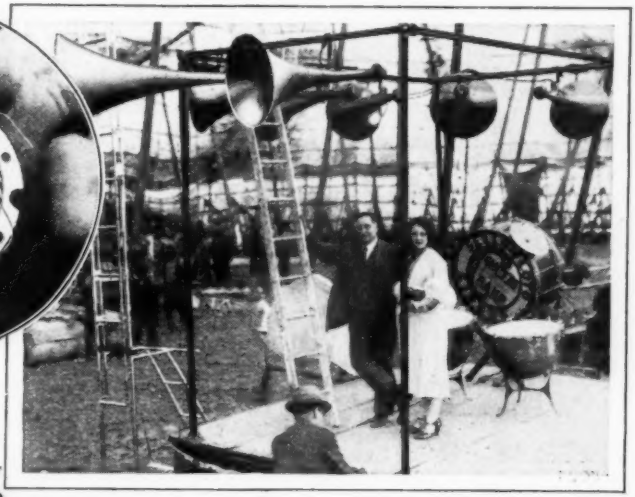
Because horses, lions, monkeys and elephants do not reduce their appetites during hard times; and gold braid, rhinestones, ostrich feathers and other costly costume materials still must be used, the circus today is keeping an eye on economy. Besides finding new ways of attracting and entertaining customers, circus operators are calling upon science and inventors for machines that will save labor, time and money. However, in many cases science has nothing helpful to offer, at least not in usable form.

No one realizes this more than W. H. (Bill) Curtiss, veteran showman with Sells-Floto, and well-known inside circus tents and out as an inventor.

Not long ago the jacks which support seats in the main tent had to be staked in-

New Field for INVENTIONS

Here's improved type of diaphragm used in circus loud-speaker to furnish distinct reproduction.



The picturesque, silk-hatted ringmaster now remains silent, and circus patrons hear the acts announced over a public address system that has been developed specially for use under the big tops. Vacuum tube amplifiers increase the voice to stentorian proportions, carrying to all directions.

Besides being a veteran circus man, W. H. Curtiss, of Sells-Floto, is an inventor of note. One of his contrivances is shown here—a chain and crosspiece arrangement that ties seat jacks together, eliminating hundreds of stakes as well as saving much time, labor and money.

dividually to keep them from slipping and endangering customers. This meant the driving and pulling of hundreds of stakes every day, in addition to the thousand or so used on tents. Curtiss worked out a chain arrangement which ties the lower ends of jacks together in such manner that the seat-supporting system cannot collapse. This invention, in use generally, saves much time and labor, both of which are valuable.

Mechanical stake drivers came into the picture several years ago, starting the gradual exit of picturesque sledge swingers; but it was not until a short time ago that a machine capable of driving three stakes at once was perfected. It can hammer down 312 tent stakes in 54 minutes!

Curtiss is now working out the design for a hydraulic stake puller. Of course, mechanical pullers have been used, but evidently they were in need of improvement because the good old pole-and-chain method still is preferred in some shows.

Curtiss believes that a hydraulic puller so braced that it cannot tip over will replace all hand extracting. It will have to handle steel stakes as well as wood because some circus lots are composed of material which nothing short of tool steel will penetrate.

Circus Needs an All-Purpose Tractor

At Peru, Indiana, where a thousand circus horses are quartered during the idle season, it costs between $400 and $500 a day for feed, in addition to labor and other expenses. Most of these horses are used only for pulling circus wagons and performing other jobs that could be done better by a suitable caterpillar tractor.

However, no tractor is available that can be used on both paved roadways and soft, muddy circus lots without requiring valuable time for installing or removing treads which will not damage pavements. Curtiss believes that some enterprising manufacturer or engineer will perfect a rubber tread that will solve the problem completely. Attempts have been made, but for some reason the improvements never have reached the circus world.

Rubber-tired tractors have been tried, and in fact are being used regularly by circuses. But when they get into even moderately soft or rough ground, the trusty ele-

Clowns Develop Freak Inventions to Get Laughs From Circus Audiences

phants have to be called upon to keep the wheels from becoming mired, or to push them out if they do.

It doesn't take long for the roadways over a circus lot to become badly rutted, so that the elephants do not enjoy much leisure. The man who produces a tractor that will meet circus requirements will become the elephants' friend for life; but, more important, he will enable the circus to save vast time and labor.

Inventor Comes to Aid of Sea Elephant

Recently the sea elephant profited by someone's ingenuity. A canvas tank in which he can lounge beneath comfortable salt water was built. Although he will wear out eight or nine new tanks a season dragging his 6,000 pounds over them, canvas has proved so far the most economical material.

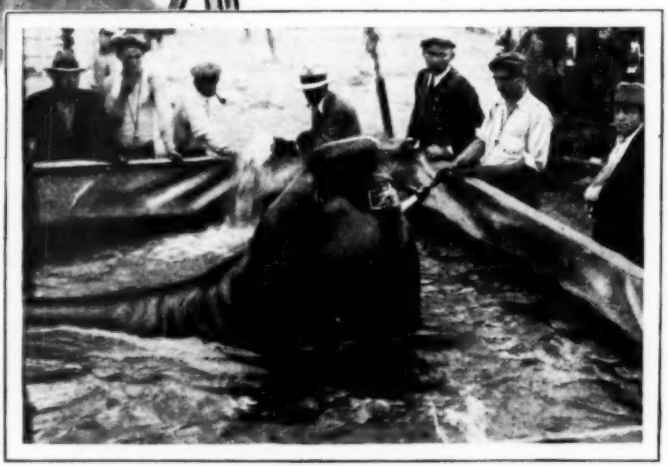
The tank is unfolded and placed on a padding of straw to reduce wear and tear on the bottom. Then salt water—the sea elephant uses 100 lbs. of salt a day—is hauled to the tank in trucks and transferred by means of pumps driven by the tractor motors.

Much of the inventing that goes on about a circus is done by the clowns. They are forever working out new mechanical devices which will get a laugh out of children, and perhaps the grown-ups as well, if the inventions are notably successful.

Trick cameras that release a mechanical goose or blow powder over the subject when the button is pressed; a magic box that converts an egg into a rabbit; trick costumes that enable a man to transform himself into a goat—these are but a suggestion of the brain children which come from the clown division.

An invention that is always welcome is something which will make side-show patrons part with an extra dime. One example, the now well-known sword-and-box trick, has earned thousands of dollars. The latest form consists of a box into which swords and wide steel plates are thrust, while a girl reposes inside, lying with mathematical nicety in just the right place.

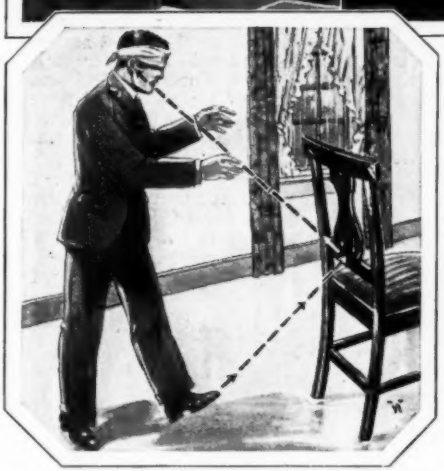
Sawdust, which used to bulk large in circus equipment, and without which no circus would be complete, now comes in tightly packed bales as shown, which are broken open in circus rings.



Above—While the clowns are away, one of the fair performers tries out a typical clown invention. When the bulb is pressed, powder is blown into the subject's face. At the same time a catch is released causing a mechanical goose to spring out. Right—To make the 6000 lb. sea elephant feel at home, circus inventors have perfected an economical canvas tank which stands hardest wear and tear. The water, which is being pumped in by tractors, is salty to make the occupant feel as if he were in his native habitat. When the circus travels, the sea elephant occupies a private car.

Eyes Beneath the Skin---a SIXTH Sense?

Above is seen M. Ouvrien, of Lille, France, demonstrating his strange ability to see with his eyes bandaged. At left, he has just recovered a doll hidden in a drawer in an obscure corner of the room. The other picture shows him just after driving a car through heavy Paris traffic, where he successfully dodged other cars and stopped for traffic signals which he could not see through blindfolded eyes.



Dolansky's explanation of the ability of blind people to sense obstacles in their path has an auditory basis. He believes the modification in sound waves of footsteps caused by reflection from the obstacle conveys a warning to the ear.

RECENT amazing demonstrations of the abilities of certain individuals to drive cars through heavy traffic and to find objects hidden in a room while completely blindfolded, have led scientists to the belief that all of us are endowed with a sixth sense which transmits images to the brain entirely apart from the usual organs of vision.

The editor of a Parisian magazine, skeptical of the claims of M. Ouvrien, of Lille, France, that he could see objects when his eyes were sealed and bandaged, sent a trusted reporter to investigate. Before a large crowd a doctor examined M. Ouvrien's eyes and they were bandaged with a black cloth which totally excluded all light.

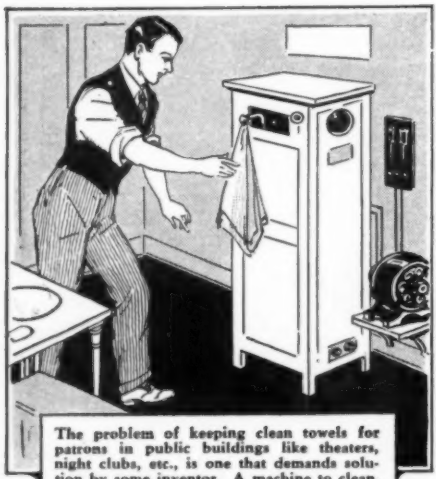
With the reporter at his side to make sure there was no tampering with the bandage, M. Ouvrien took his seat at the wheel of a car and drove it through heavy traffic, stopping for red lights, passing slow moving vehicles, and once stopping abruptly when a dog ran in front of the wheels.

To explain the well-authenticated abilities of M. Ouvrien, Louis Farigoule, noted French scientist, recently advanced the theory before a gathering of doctors and scientists that man possesses millions of rudimentary eyes located at the end of each nerve in the body. To prove his theory, Dr. Farigoule has made thousands of experiments on blind people and those with normal vision. By eyes beneath the skin he did not, of course, mean optical organs such as we possess in our head, but rather referred to a sensitive apparatus at the end of each nerve which is capable of conveying optical images to the brain. In most people, this ability is latent, but in some exceptional cases it becomes strikingly evident.

Sound Waves May Explain Phenomenon

Other theories have been advanced to explain the apparent phenomenon of vision outside the eyes. Vladimir Dolansky, Polish scientist, himself a blind man, believes the ability of a blind man to sense obstacles in his path springs from warnings picked up by the ear. Blind individuals explain that they experience a peculiar sensation when approaching an obstacle, much as if some tenuous object were grazing their faces. According to Dr. Dolansky, it is the modification caused by the reflection of sound waves produced by footsteps which warns the blind person of the presence of the obstacle.

Fortune Making IDEAS



The problem of keeping clean towels for patrons in public buildings like theaters, night clubs, etc., is one that demands solution by some inventor. A machine to clean, dry and disinfect towels automatically on the spot will fill the bill and make a fortune.

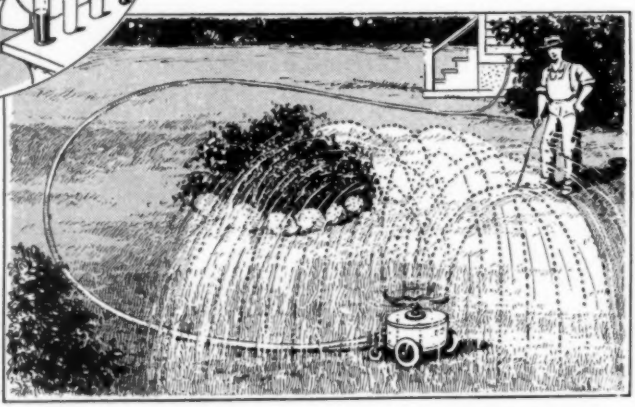
Many inventors who can devise marvelously ingenious machines labor under one great defect—they can't perceive what the public needs, and so much intelligent effort goes to waste. In this department, Mr. Yates outlines those needs so that inventors will have expert guidance in exercising their talents.

AS I write I have before me a most important piece of news for inventors and those interested in invention. The item states that the Inventors Cooperative League has just completed a most successful exhibition of inventions at the Grand Central Palace in New York and that a permanent exhibition of its members' inventions will be established at 177 Greenwich Street, New York City, under the name United States Invention Mart.

This is important and vital news for inventors, but more important is the Practicality Committee of the League. It is the function of this Committee to examine ideas submitted by inventors (members) and to give advice concerning the application for patents. Those who have read my pleading along this line will easily understand how terribly sympathetic I am with any movement to make inventors look before they leap. If you want more dope on this League write to me in care of MODERN MECHANIX AND INVENTIONS and I'll be glad to help you all I can.

Now to get down to our subject of Needed Inventions.

You chemical fans might find a young fortune in solving the vile-tasting pipe problem. What is needed is some simple, inexpensive treatment that would make a new pipe taste as mellow and sweet as an old one. Presence of natural oil in the fiber of the bowl of a new pipe is what creates the raw distasteful smoke. An application of heat, or perhaps boiling, would do the job. Whatever it is, the material should be cheap enough to be sold to pipe smokers over the five and dime counter. If properly exploited the idea should easily be worth $100,000.



Wanted—a perambulating sprinkler that will water the whole lawn without attention.

for INVENTORS

by Raymond F. Yates

Instructions to Inventors Wanting Advice.

Mr. Yates, who conducts this special department for inventors, stands always ready to give expert advice to Modern Mechanix and Inventions readers on patent, law and marketing procedure. When requesting advice, however, do not send models, as they cannot be accepted. Your requests will be taken care of promptly and adequately if you merely send a clear drawing and complete constructional and operating data. Stamped return envelope must be enclosed. Address Mr. Yates in care of Modern Mechanix and Inventions, 529 So. 7th Street, Minneapolis, Minn.

1. Sanitary Towel Dispenser

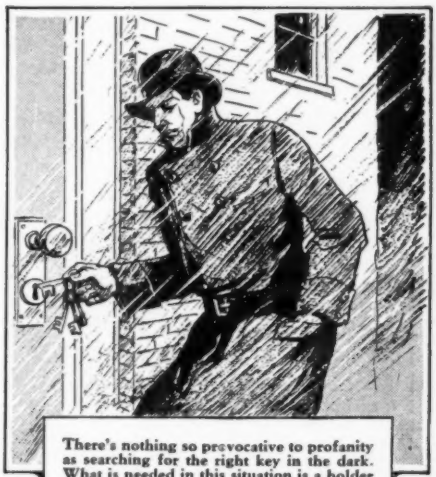
In public buildings like theaters, the problem of keeping clean towels for the patrons is ever present. To keep a supply of tissue is costly and wasteful. To keep a supply of clean linen towels is also costly and, if not done properly, highly unsanitary.

Why not a machine driven by an electrical motor and containing an electric heater and powerful bath of germicide that would take a towel, clean and dry it in say one minute? Then a machine could be had that would have a supply of ten towels and as the patron finished with a towel it would be automatically placed in the bath, squeezed out and exposed to the electric heater where, with a forced draft of hot air, it would soon be conveyed back to the rack for the next person to use.

Specifications: Should cost about $75.00 and should not be so complicated that it would need constant servicing.

Exploitation: Should be patented in the United States only. Could be sold for $50,000.

(Continued on page 158)

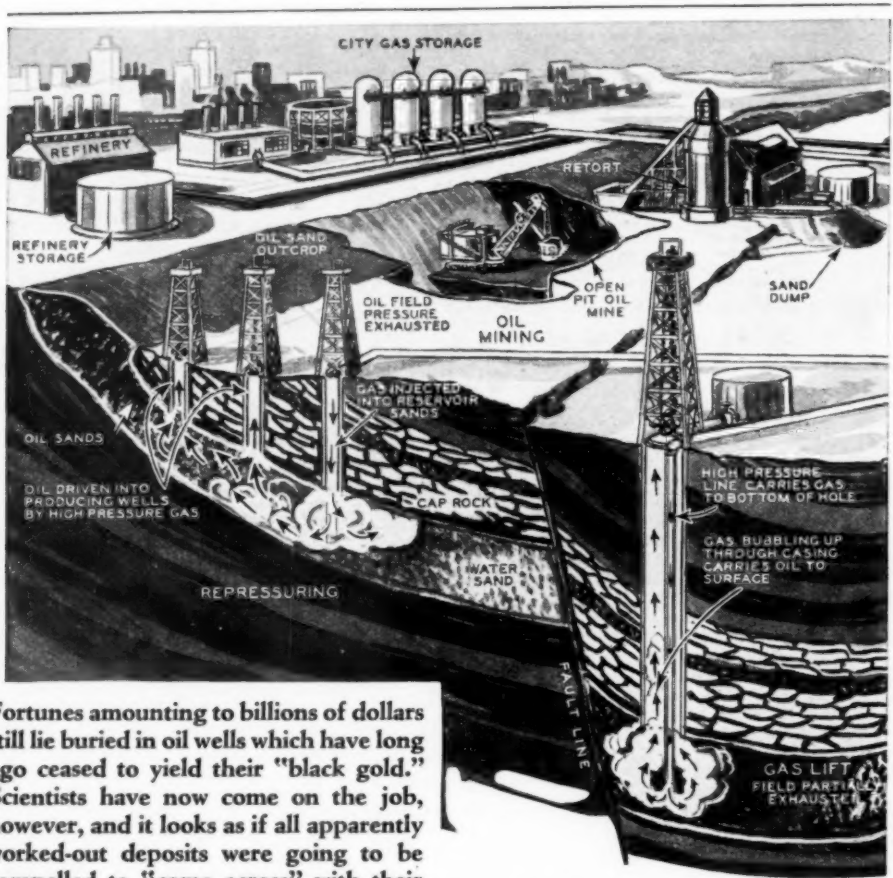


There's nothing so provocative to profanity as searching for the right key in the dark. What is needed in this situation is a holder that will permit you to press a button, popping the right key out ready for use.

The leaky radiator problem will be with us until a new method of cooling is developed.

The need for a container that will preserve such perishables as dry ice and ice cream over a longer period of time is urgently needed. The container must be of some common, inexpensive material that can be given away with little loss to the merchant. That's the chief requisite. It should add at least 50 per cent to the time that food may be kept cold, and keep dry ice in solid form. The material from which the container is made may be anything as long as it is clean and practical. Such an invention would easily bring in a neat young fortune of at least $100,000. Get to work on it.

Forcing Buried Treasure from



Injecting gas under high pressure into defunct oil wells, as illustrated in sectional view of earth here, sometimes makes possible reclamation of many millions of dollars worth of "black gold" which would otherwise be lost.

Fortunes amounting to billions of dollars still lie buried in oil wells which have long ago ceased to yield their "black gold." Scientists have now come on the job, however, and it looks as if all apparently worked-out deposits were going to be compelled to "come across" with their riches through methods of extraction described in the accompanying article.

A BURIED treasure worth at least fifteen billion dollars today lies awaiting a claimant. Its location is definitely known. Very probably a good part of it is within four or five hundred miles from your home —perhaps almost at your back door.

To recover this tremendous fortune is the goal of an army of engineers and geologists who today are conducting one of the most widespread treasure hunts in history.

For every barrel of oil that is taken out of a modern oil well, at least two barrels remain in the ground and will never be recovered under present production methods. Experts estimate the total amount of this oil at twenty-six billion barrels.

When the producing fields of today are exhausted, and oil, scarce, mounts in value, this huge store of petroleum remaining will constitute a fortune whose size will stagger the imagination.

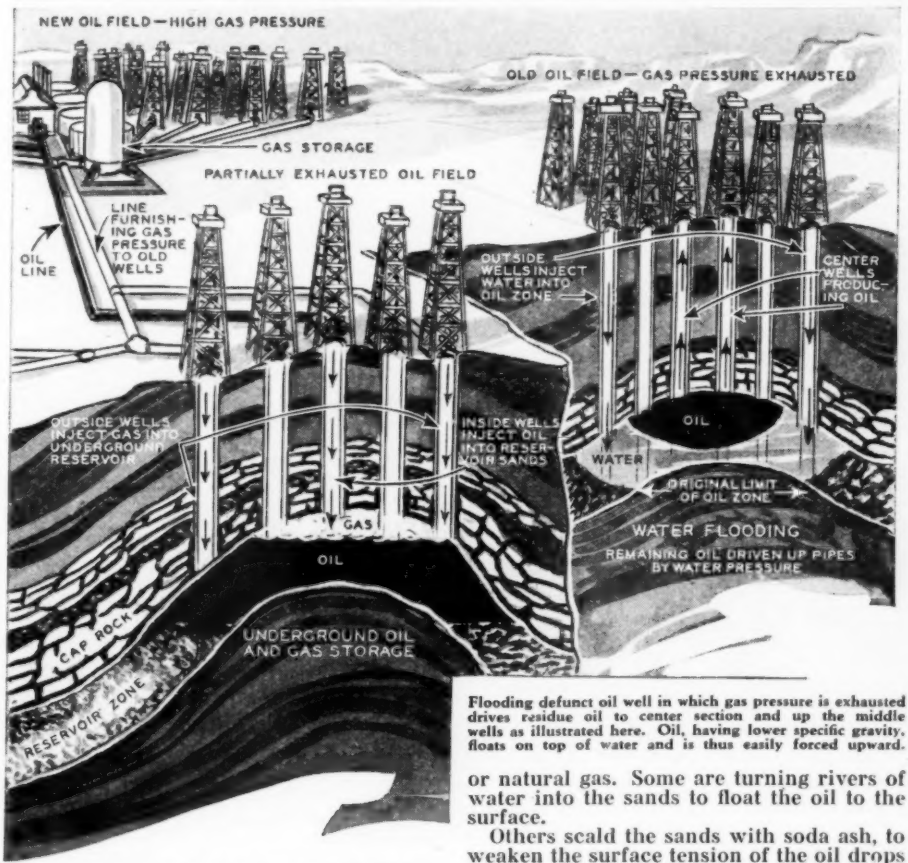
Amazingly inefficient seem modern oil production methods, when millions of dollars and the skill of the best geologists and engineers are spent to locate and drill an oil field, only to be abandoned leaving twice as much oil below ground as is ever extracted.

What a challenge to the geologist of today! Can he, through startling new engineering achievements, recover this marvellous store of wealth and prevent this criminal waste of our natural resources?

Most oil wells are born full-grown, at the

Dead OIL WELLS

by STERLING GLEASON



Flooding defunct oil well in which gas pressure is exhausted drives residue oil to center section and up the middle wells as illustrated here. Oil, having lower specific gravity, floats on top of water and is thus easily forced upward.

Reversing production methods, engineers in California have pumped oil and gas back into deposits for storage. This stunt increases yield of well when it is re-opened.

height of their strength. From the moment the first spectacular burst sends oil spattering over the derrick top, production is steadily on the down-grade. Dwindling gas pressure sends less and less oil to the surface, until finally it becomes too weak to tear the clinging drops of crude oil from the "reservoir" rocks or sands, and the well must be pumped.

To find ways of extracting this black gold from defunct oil fields after dying gas pressure no longer drives it to the surface, geologists already have developed many improved scientific methods.

Some are using vacuum pumps to suck gas and oil from the depths. Others blow up the oil formation like an automobile tire, using a powerful stream of compressed air or natural gas. Some are turning rivers of water into the sands to float the oil to the surface.

Others scald the sands with soda ash, to weaken the surface tension of the oil drops and cause them to flow more readily. Still others are turing miners, sinking shafts into outcroppings and driving galleries into the formations, whence oil is pumped or scrubbed from the sands with superheated steam.

Although the entrance of water generally signifies the approaching end of a well's useful life, it is sometimes harnessed by geologists to prolong production.

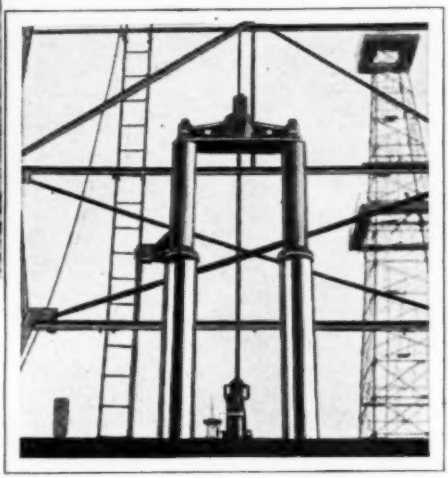
The immense Bradford field in Pennsylvania, the largest field in the world, was reaching old age, when some mishap caused water to flow into the producing formations, flooding the oil sands. To the surprise of oil men, nearby wells began to pick up production.

Apparently the water, seeping through the sands, was pushing the oil ahead of it in a gradually swelling wave, increasing the production of some dying wells by 20% and more.

Science Applies "Artificial Respiration" to Raise Oil Well Gas Pressure

Elk Hills field, California, which still holds vast treasures in oil that may be extracted by improved methods.

This tree limb marks the site of a once richly productive oil well which is now merely a trickle of asphalt. Yet it still holds a fortune in unextracted oil.



Here's the latest in oil well pumps, which is powered by gas from new wells. Two cylinders joined by the yoke travel up and down, lifting the sucker rod extending down in well.

In preparing a field for water flooding, engineers first make a subsurface map of the field, to determine which are the edge wells. These wells are then flooded by pumping in water. As the water pushes the oil ahead of it, higher wells begin to flow faster. After four to eight months, the production climbs steadily, reaching a peak usually in ten to twelve months. Eventually the water reaches the higher wells, which in turn become edge wells into which water is injected. This process is illustrated in an accompanying drawing.

In the Bradford field, where there are 35,000 wells, water flooding has not only extended the life of the field by at least fifty years, but has established a reserve of recoverable oil amounting to 432,500,000 barrels.

Another method is to inject compressed air or natural gas through a small pipe lowered below the surface of the oil but not to the bottom of the hole, as illustrated on page 85. This method originated at Baku, Roumania; where a 60-barrel well was raised to produce 300 barrels per day.

Sometimes the method is extended to a whole field, by introducing gas at a pressure of from 40 to 300 pounds per square inch, into a center well, and pumping surrounding wells, or applying it at edge wells and pumping those higher up.

(Continued on page 150)

Endless BELT TRAINS for Future Cities

Cities of the future may see the inhabitants transported on this endless belt system, which has recently been developed in Westinghouse laboratories. Passengers board slow-moving local belts, then step to faster belts, reversing process for exit.

TRANSPORTATION of city inhabitants through subway or overhead tubes on endlessly moving belts, providing more speed and comfort than our present systems of passenger service, loom as a possibility, according to Norman W. Storer, engineer of the Westinghouse Electrical Co., who has developed the idea.

As described by Mr. Storer, the system is an arrangement of continuous trains or belts of cars, running on parallel tracks. There is a stationary loading platform along the entire course of the system.

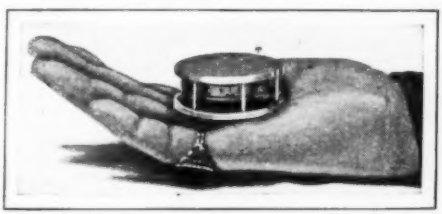
Passengers board the first local train at any point, and it stops every 50 seconds for a period of 10 seconds. When the doors close, a gong sounds and the local platform starts moving. Now there is another signal and gates open for a second platform, or express, on which the passenger takes the major part of his trip. After ten seconds the gates close and the local slows down for another stop, while the express picks up to a 22 m.p.h. speed.

Noise of the system is at a minimum, and passengers are delivered at no more than 300 feet from their streets. All stations are controlled from one central point, all elements being so timed that there can be no hitches.

Plane Type Compass for Hunters

IDEAL for hunters, hikers, Boy Scouts and even aviators whose regular instrument has failed, is a direct reading, oil pocket, airplane type of compass now on the market. So small that it can be held in the palm of the hand, as demonstrated in the above photo, the compass yet proves amazingly accurate. The pivots work in an oil pocket, providing the utmost in flexibility. One outstanding advantage is that it reads the way you are looking, which means that it points out the direction in which you stand.

It will stand the roughest usage without impairment of its accuracy.



Last word in accuracy and convenience is found in this pocket compass, so small that it can be held in palm of hand. Pivoting in oil pocket, it has minimum inertia.

Improved Mask for Racing Drivers Reduces Fog Danger

Phil Schafer, auto racer, wearing the cellophane mask which he brought back from Germany to introduce on Indianapolis speedway. There is little danger of mask fogging over.

WHAT style of goggles the well dressed racing driver will wear was recently displayed by Phil Schafer, famous speed king, who is well known on the Indianapolis track.

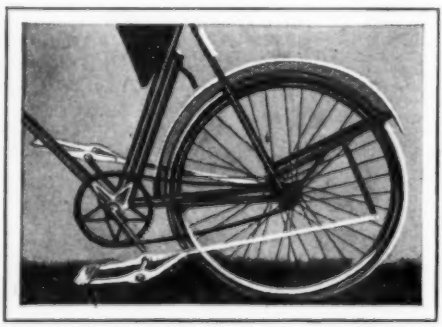
First introduced in Germany and brought to America by Schafer, the cap has a cellophane shield depending from the visor, providing unrestricted vision in all directions, at the same time guarding the eyes from cinders, rain and fog.

Extension Pedals Aid Bike Speed

TO GET more speed out of a bicycle without increasing the direct gear ratio and without adding to the exertion of the cyclist, a Swedish blacksmith has invented an auxiliary pair of pedals, shown in the photo below.

By the use of steel strips working against a cross-member attachment to a rear mudguard and frame, he has virtually increased the gearing of his bicycle from 74 to 105 inches.

Tryouts have shown that the new equipment is not awkward and that it will enable the cyclist to ride as easily as on a bicycle with a 60-inch gearing. The seat must of necessity be moved forward to compensate for the forward reach of the pedals.



New pedal attachment, invented by Swedish blacksmith, in effect increases gearing of bike from 74 to 105, giving greater speed without much additional exertion to the cyclist.

Cameraman Wears His Darkroom

PITY the poor news cameraman. In other days he carried his camera slung over his shoulders, but now he must wear it.

This innovation in cameras, shown in the photo below, made its first appearance during a sports meet in Birmingham, England. The camera is a combination portable developing and printing room. In order to speed up the business of gathering news photographs for the papers, the cameraman not only takes his pictures, but immediately develops and prints them also on the spot, using the light weight outfit built into the large camera.

With the use of this camera, every function of photographing is performed on the field, so that the editor gets the picture along with the story.

English newspaper cameraman wears his camera. Giant box, worn on shoulder, houses portable darkroom, which permits photographer to take pictures and develop films on the spot.

Light Gets Tired and Turns Red

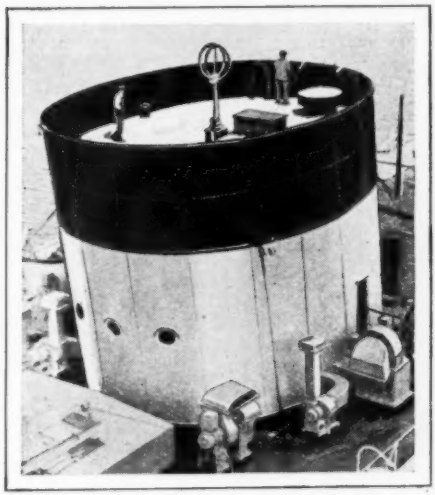
THAT light rays get tired as they travel for millions of years through space, fritter away a little of themselves century by century and end by changing color so that rays which started as blue ones may finish by becoming red is suggested by scientists. Astronomers have discovered that light rays coming to the earth from the most distant nebulae actually show what is called the "red shift," which means the light from these nebulae is shifted a little toward the red end of the spectrum. What may be happening is that each tiny bit of each light ray may lose a small fraction of its substance as it moves through space.

"Georgic" Has Direction Finder Built in Dummy Funnel

ON THE new White Star liner "Georgic," launched recently in England, new ideas on the installation of radio equipment have been applied with decided success.

Most modern liners have funnels purely for decorative purposes, for a big ship wouldn't look natural without huge rakish stacks. Builders of the "Georgic," however, decided that the dummy funnel wouldn't be all waste space, so they installed in it the ship's radio direction finding equipment.

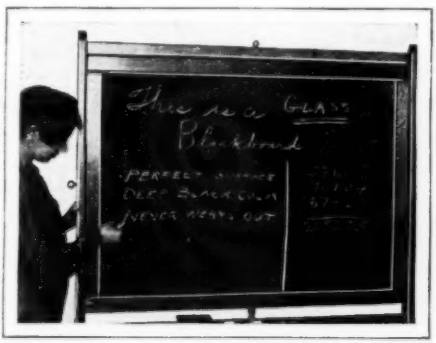
A great improvement was thereby effected. Radio operators found it possible to take directions continuously without slightest interference, the metal of the funnel acting as a screen against local electrical disturbances. The loop antenna is seen in the photo at the right.



Situated in top of funnel, direction finding loop of liner "Georgic" is screened from local electrical disturbances.

Glass Replaces Slate in Blackboard

GLASS blackboards are now ousting the slate board from the lecture and school room. Made of black plate glass, with a suspended abrasive dispersed throughout the material while in a molten state, the new board has the same texture as the slate product, but all defects such as light color, knots, laminations, and burls are eliminated. The weight of the glass boards is, size for size, approximately the same as for slate.



Light color, knots, laminations and burls common to slate are eliminated in new plate glass blackboard, which is manufactured by dispersing abrasive through glass while molten.

Poor Kids More Immune to Germs

SURPRISING facts about the numbers of Canadian school children who get germ diseases such as measles and scarlet fever were reported to the Canadian Public Health Associations. Contrary to what might have been expected, children from the better districts of the city, a survey disclosed, were found to have had more cases of the germ diseases classed as communicable than children from poorer neighborhoods

Toreadors Don't Know Their Bulls

BULL fighters of Spain learned recently that all these years they have been waving red rags in a bull's face when a rag of any other color would have done just as well. For, contrary to the popular idea, bulls are completely color blind, a fact discovered in tests conducted by the Museum of Science and Industry in New York.

View Scenery Through Signboard

BEAUTIFUL scenery along the highways will no longer be hidden from view, thanks to the development of a new type of sign made of wire mesh. As shown below, the letters, cut from sheet iron, are hung on the wire netting, being secured with brass bolts. The mesh is substantial, but large enough so that scenery behind is not concealed from motorists.

Scenery along highways is not hidden from view by this signboard having sheet iron letters hung on wire netting.

Make Hallowe'en Whoopee

Fig. 1. Source of some keen amusement on Hallowe'en will be this oracular dummy, which mysteriously answers your questions.

Fig. 3. Which of newlyweds will be boss? This Hallowe'en stunt says first one to eat prune on string will be master of the house.

by

DALE R. VAN HORN

A Hallowe'en party might be defined as a nocturnal orgy of nonsensical abandon. In other words, an affair where any goofy trick is in order. If you want to show your guests some real fun perform the stunts described here and there won't be a single moment of boredom.

Fig. 2. Hallowe'en is logical time to tell fortunes. What lies in future is determined by which dish you pick. You have choice of bacherlorhood, marriage, and ocean trip.

ON HALLOWE'EN Eve you can stage all the goofy stunts you have been wanting to exploit for a long time. Nothing is too low-brow for the occasion. It is the one time of the whole year, not even excepting New Year's, when you can forget worldly cares and the weight of adult responsibilities, and have a thoroughly good time.

Last year on Hallowe'en the writer happened past the house of friends. Outlandish laughter and noises prompted quick interest. There was an unholy glow from a front room and forsaking the axiom of moralists, we peeked inside.

Grouped about the dining table, sat the guests. The only illumination came from a bowl and the flickering light that burned therein gave the assembled faces a horribly greenish cast.

Later, some tactful questioning brought out the simple prop—a dish of water and alcohol which had been ignited. Each guest was supposed to make a solemn wish which was to come true within six months. Maybe so and maybe not, but there was no doubt about the effectiveness of the setting.

Oracular Dummy Mystifies Guests

The high spot of another Hallowe'en party was an improvised dummy placed upon a shelf. This dummy would answer any question asked of it and not one person present was able to fully figure out the arrangement.

The scheme called for some preliminary work, and a bit of ingenuity. The figure was hastily made from cloth and stuffed to life-like dimensions. The face was covered with a mask. Inside the body was a small tin funnel to which was connected a gar-

with Mechanical TRICKS

Fig. 4. Productive of much amusement and some danger is the trick of walking downstairs backward, with only a mirror for guidance. At right, Fig. 5. Mechanism of the "Crossing the Desert" stunt. Large barrel hoop is secured to wall as illustrated and draped with cloth, on bottom of which is second hoop. This latter is dropped down over the victim with the cord passing up over pulley.

Fig. 6. Victim of desert crossing stunt is led behind curtain where shroud is suddenly dropped, to accompaniment of squeals.

den hose as illustrated in Fig. 1. With a lookout to relay the questions, the "oracle" had only to know the questions and concoct appropriate answers aided by nimble wits. Pains must of course be taken to muffle the tones from the other room.

An ideal place for a more pretentious party is some shed or old house. Here freedom is greater and you can more easily set up special tricks.

"Crossing Desert" Terrifies Victim

The outstanding thriller of one such party was a draped off corner in a darkened room. It was imperative that each guest go through this ordeal, called "Crossing the Desert" for some inane reason. One at a time, a guest was ushered behind this corner curtain. Once inside an operator released a cord and the victim found himself completely enveloped in a shroud. The process was invariably accompanied by shrill yells and shrieks.

The mechanism, simplicity in itself, is shown in Fig. 5. Two barrel hoops, one larger than the other, some cloth, a small pulley and some cord were the props needed. The larger hoop was fixed to the wall and both hoops sewed to the ends of a cylindrical enclosure of cloth. The smaller hoop was drawn up through the larger and held there by cords as shown. At a given signal, the smaller hoop was released and fell to the waist of the victim. A pull on the cord and the initiated was released again.

Fig. 7. Guests will get a big bang out of contest to see who can be first to eat fruit from barrel hoop suspended from the ceiling with cord, as illustrated in this drawing.

If you are to stage the party in an old building, the tricky platform will prove a real thriller. This 4 foot square platform is raised above the floor about 7 inches. It is placed where each person must pass over it. In front of a door is an ideal place.

Innocent Looking Platform Upsets the Victim to Amusement of Guests

Fig. 8. When victim steps upon this platform he suddenly loses his equilibrium, to amusement of other guests at the party.

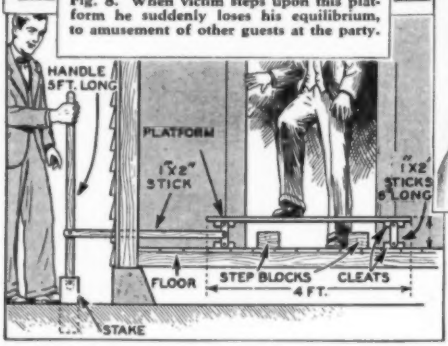


Fig. 9. Details of the platform seen at top of page are given here. When trickster behind scene pulls the lever, victim loses his balance and takes a harmless tumble.

Fig. 9 shows the installation. Four 6 inch sticks are bolted to cleats nailed to the under side and one vertical stick is connected to a longer stick which passed through the wall and to a lever mounted outside. It should be so arranged that when the lever is upright, the platform supporting sticks are also upright. The operator then merely waits until vibrations tell him someone is on the platform, then the lever is pulled sharply over. Stop blocks beneath the platform prevent it from falling more than 2 inches, but this fall is not only quick, but also sideways, and it will give the victim a decidedly scrambled equilibrium—for a moment.

According to legend, Hallowe'en Eve is the logical time to tell fortunes and foretell the future. There are many interesting games and methods to be used. Here is one:

Blindfold the subject. Place four dishes of the same kind on the table as in Fig. 2.

Fig. 10, above—a trick requiring steady nerves. One subject sits on a round bottle holding a needle, while other subject sits on another bottle holding a thread. The trick is to thread the needle. Looks easy but try it and you'll be surprised at what happens. Left—Hallowe'en would not be complete without an array of grotesque falsefaces. Take a good look at the mug shown in the photo.

In one place a piece of cloth, in another some soil, in another water and in the fourth a wedding ring. Turn the blindfolded person around three times, then have him or her place a finger in one of the dishes.

If the rag is chosen, the oracle says that person will be an old maid or bachelor; if the water, an ocean trip is in store; if the ring, wedding bells will soon ring; and if the dirt, divorce lies ahead. Silly, but quite interesting and laugh-provoking.

Simple Tricks Prove Startling

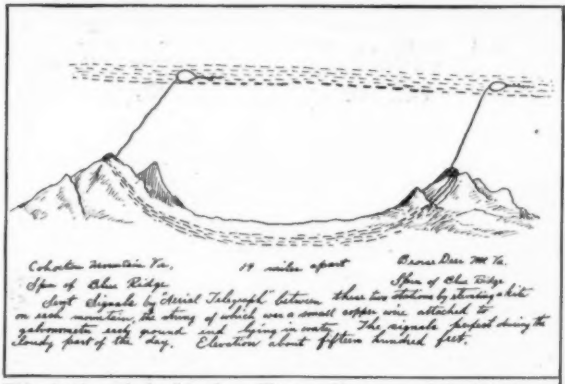
If you want to impose a hardship, have a guest walk down stairs backward with a mirror in his or her hand. The stunt looks simple, but isn't. Have willing hands ready to catch the victim if necessary.

The biggest shock of a whole evening once was caused by a pair of pie tins. An operator, hidden in a corner, waited until all was quiet. Then he let go with these, one on each hand. The effect was electric. These gadgets are easily prepared—a small strap on the bottom of each tin for the hands to pass through. Two of these will make a lot of noise.

If an about-to-be-married couple is present, you can turn their discomfiture into chuckles with a prune and piece of string.

(Continued on page 152)

Records Show U.S. Dentist Invented Radio


Sept Signals by Aerial Telegraph between these two stations by means of kite
The signals stopped during the
Elevation about fifteen hundred feet.

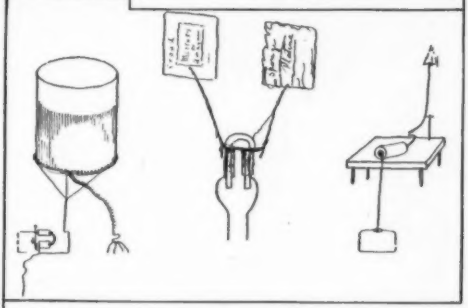
This sketch made by Loomis to illustrate his system of "aerial telegraphy," shows how kite was sent aloft from two mountain peaks to carry antenna. At right is shown an old portrait of Dr. Mahlon Loomis.

UNITED STATES PATENT OFFICE.

MAHLON LOOMIS, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN TELEGRAPHING

Documentary proof that Loomis introduced radio in 1872 is given in this photo of the patent granted on July 30th of that year, bearing title, "Improvement in Telegraphing."



Crude transmitting and receiving instruments constructed by Loomis back in the 80's are illustrated in this sketch, which is basis of Loomis's claim to invention of radio.

ONCE upon a time there was a very unfortunate inventor who lived and died before the world had wisdom and foresight enough to appreciate the work he was trying to do.

That inventor was Dr. Mahlon Loomis, who, no doubt, was the first man in the world successfully to transmit a message without the use of wires.

Loomis called his first system "aerial telegraphy," and his first public demonstration was made in 1866 from two peaks of the Blue Ridge mountains of Virginia. Two kites were sent up, one from each summit, which were about 18 miles apart. These kites each had a small piece of fine copper wire gauze attached to their under sides and connected with the wire, 600 feet in length, which held the kites when aloft.

The apparatus of both stations were attached to an ordinary battery. In the historic test, the messages were claimed to be just as exact and distinct as any that ever traveled over metallic conductors.

Loomis was granted a patent on his invention July 30th, 1872. The patent, a copy of which appears above, was numbered 129,971, and is entitled "Improvements in Telegraphing." Inspired by the success of Morse, Loomis placed his idea before Congress and made an appeal for assistance. The appeal was refused, and Loomis died shortly after, before he could realize his ambitions.

The sketches shown above prove conclusively that Loomis had a very clear idea of the fundamentals of radio as we understand them today. If it could be proved conclusively that Loomis employed high frequency currents, it would knock Marconi's claims into a cocked hat.

Mechanical Radio Man Talks, Sings, Walks, and Rolls Eyes

Mechanical radio controlled robot invented by Berlin engineer is shown above being put through its paces. "Brains" of mechanical man, or radio receiver, is pointed out below.

A YOUNG engineer in Berlin, after four years of work, has just perfected what is the strangest type of man ever to appear on this earth. The thing, shown in the photo at the left, outdoes Frankenstein in everything save looks. So perfect is it mechanically that it can move its lips, eyes, hands, legs, and even wag its ears.

Directions from the monitor are projected into the "brains" of the mechanical man by radio waves. Perfect synchronism makes it possible for the man to speak and gesture at the same time, so that as an attention-getting advertisement it works well. The brains of the "man" are a super-sensitive radio receiving set.

"Artificial Heart" Restores Life

BRINGING back to life persons apparently dead by use of a new apparatus which keeps the blood circulating for a while although the heart has stopped, is the newest accomplishment of medical science. The machine employed in the feat is designed to apply alternate pressure and suction to the part of the chest containing the heart, so that blood alternately is sucked into that organ and forced out of it to keep up an approximation of the normal circulation maintained by the heartbeat.

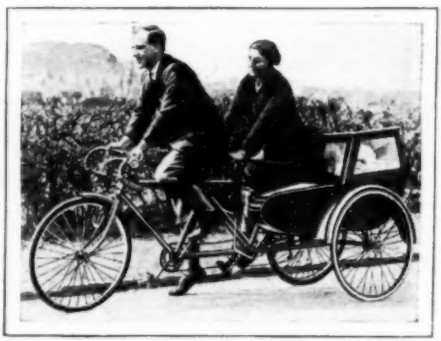
It sometimes happens that the heart stops beating for a time because of poisoning or electric shock or some other circumstance which will pass if the patient can be kept alive long enough for the cure. The "artificial heart" may serve to keep the victims alive so that they ultimately recover.

We're Poisoned Little Every Day

THE possibility of wide-spread, unsuspected harm to public health from small amounts of poisonous elements such as arsenic and lead, known to be contained in foods, drinks and in the air, is to be examined by scientists. In an industrial civilization, it is believed, the population is exposed to a great variety of these metallic poisons. Growing fruits or vegetables, for example, are often sprayed with compounds of lead or arsenic intended to kill harmful insects or other parasites. It is probable that these poisons seldom are removed completely before the fruits or vegetables are eaten. Drinking water may contain small amounts of metal dissolved from the pipes or machinery used to handle it.

Whole Family Rides One Bike

A THREE passenger bike, capable of carrying the whole family for a ride, has put in its appearance in Scotland. In the photo below you see the family which introduced the bike, pedaling down the road bound on a holiday spin through the country. The head of the house and the weaker half ride tandem fashion on the seats, while youngster rides comfortably in his enclosed side car.



Tandem bike with a special side car for junior carries this Scotch family on excursions into the great outdoors.

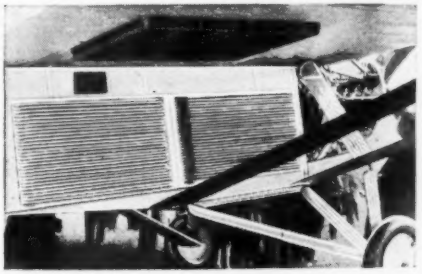
PLANE TALK

Edited by DOUGLAS ROLFE

Special Radiators for Stratosphere Plane

THE current rage for stratospheric navigation has evoked some remarkable developments in the aeronautical world. Atmospheric conditions encountered at altitudes above 10 miles call for unusual provisions in plane construction and equipment, such as hermetically sealed cockpits, adjustable pitch propellers, and greater wing area.

The Farman plane in which French pilots plan to assault the upper air has one innovation particularly worthy of note. It is a special battery of radiators which will either cool or heat the motors as might be necessary. Built like a finely woven grille, these radiators are secured to the under side of the wing and alongside the forward portion of the fuselage, as shown in the accompanying photo.

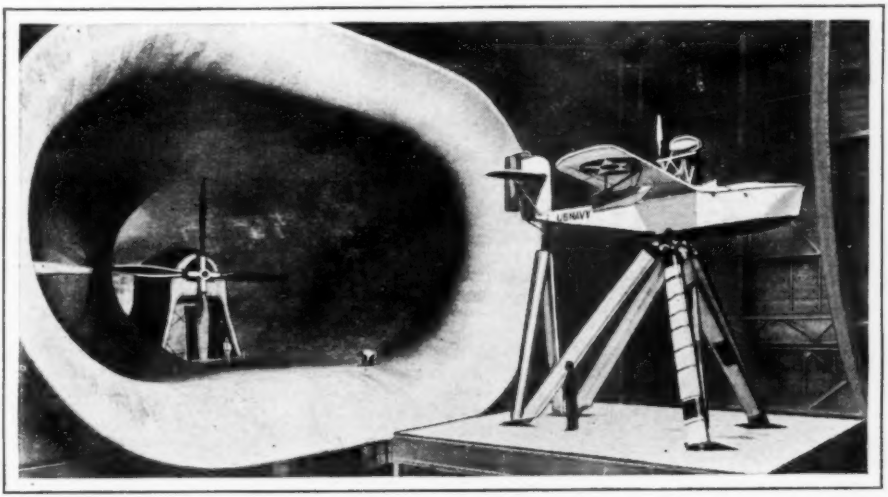


This view of the side of the remarkable new Farman stratosphere plane shows the special radiators which will either cool or heat the plane as may be demanded by the altitude. Height of 15 miles and 500 m.p.h. speed is mark of pilots.

Giant Wind Tunnel Creating 112-mile Wind Tests Out Actual Planes

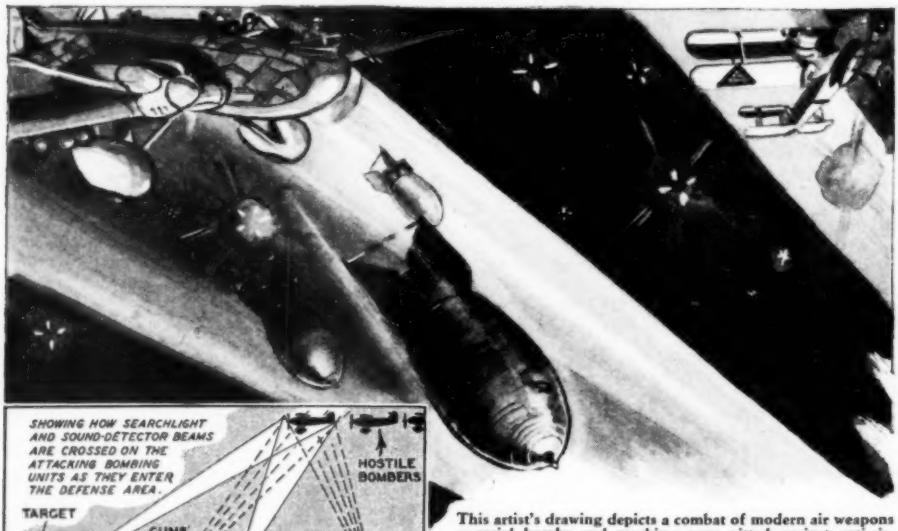
WIND tunnels have grown bigger and bigger, till at last they have reached the colossal proportions of the giant tunnel shown in the photo below. It was constructed by the National Advisory Committee on Aeronautics in a determined drive to eliminate the few remaining hazards of aerial transportation.

The test chamber is seven stories high. In the huge wind tunnel, of whose size you can gain a vivid idea by comparison with dwarf-like men in the photo, are mounted two 4,000-horsepower electric motors, each driving a four-bladed 35-foot propeller. These propellers force over the full-size flying models of the planes an artificial hurricane wind having a speed of 112 miles an hour. Gauges register strains, stresses.



Twin 35-foot propellers on two 4,000-h.p. motors force 112-mile wind over full size plane before giant wind tunnel.

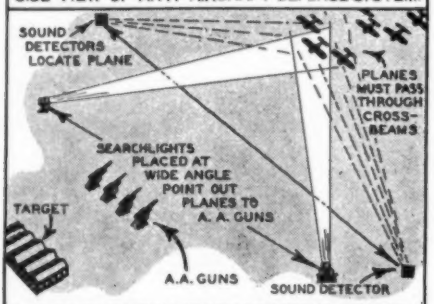
GROUND GUNS *Versus*



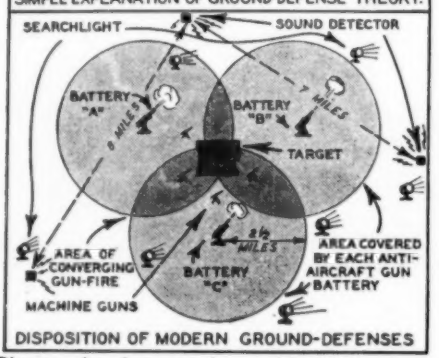
This artist's drawing depicts a combat of modern air weapons —aerial bombs and machine guns pitted against anti-aircraft guns, searchlights, and supersensitive sound detectors.

SHOWING HOW SEARCHLIGHT AND SOUND-DETECTOR BEAMS ARE CROSSED ON THE ATTACKING BOMBING UNITS AS THEY ENTER THE DEFENSE AREA.
HOSTILE BOMBERS
TARGET
GUNS
SEARCHLIGHT
SOUND DETECTOR

SIDE VIEW OF ANTI-AIRCRAFT DEFENSE SYSTEM.


SOUND DETECTORS LOCATE PLANE
PLANES MUST PASS THROUGH CROSS-BEAMS
SEARCHLIGHTS PLACED AT WIDE ANGLE POINT OUT PLANES TO A. A. GUNS
TARGET
A.A. GUNS
SOUND DETECTOR

SIMPLE EXPLANATION OF GROUND-DEFENSE THEORY.



DISPOSITION OF MODERN GROUND-DEFENSES

Diagrams show how ground guns defend plane targets.

Just how effective is modern anti-aircraft defense? Has science developed guns, intricate computing sights and sound detectors that will render the airplane helpless? Or can the airmen with their tremendous speeds and bewildering maneuverability out-general the crews of the ground guns? Read this authoritative article by an army expert for answers to these pressing questions.

DURING recent times much has been written and said concerning the improvements and developments in anti-aircraft defenses. We read of guns with increased muzzle velocity of shells and improved rapid firing mechanism; of sound detectors which locate approaching planes with amazing accuracy; of directoscopes which follow the approaching planes and automatically transmit the firing data to the guns; and of searchlights which can cross their beams on high flying aircraft in the darkest nights.

From reading of all these developments one would conclude that it would be suicide for an aviator to try and break through modern anti-aircraft defenses. But has the correct picture been given?

At the same time we hear of the almost inconceivable improvements made in bombing planes—planes that carry 2000

Airplane BOMBS

by H. H. ARNOLD

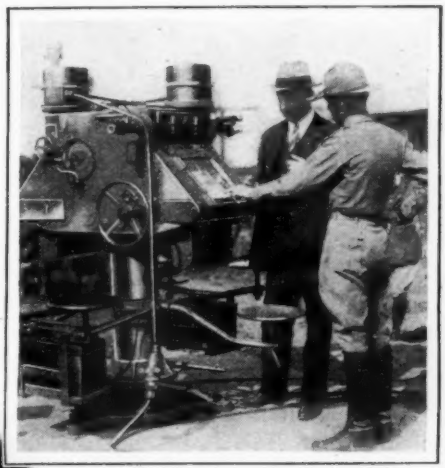
pounds of bombs at speeds of 200 miles an hour with the ease and grace of a pursuit plane; planes with such clear cut silhouettes that they are almost invisible in the air; of parachute flares which will blind ground observers, gunners and searchlight operators; of pursuit planes which lay smoke screens at the unheard of speed of 250 miles an hour, hanging their opaque curtains in the twinkling of an eye; of ground attack planes which come out of nowhere, scatter machine gun bullets by the thousands, drop multitudinous small bombs on guns, sound detectors, searchlights and directoscopes and, before anyone can get a shot at them, disappear from sight.

What's the Truth of Aerial Defense?

In order to get down to the bottom of things and see what is the real status of our aerial power and our anti-aircraft defenses let us see what actually can be done with the equipment which we have.

Even though all the devices we have for knocking down enemy planes are mechanically perfect, the problem of anti-aircraft defense is still a hard one to solve. A simple explanation of ground defense theory is shown on the opposite page. The first instrument to go into action is the sound detector, which determines the direction of and fixes the position of the approaching plane.

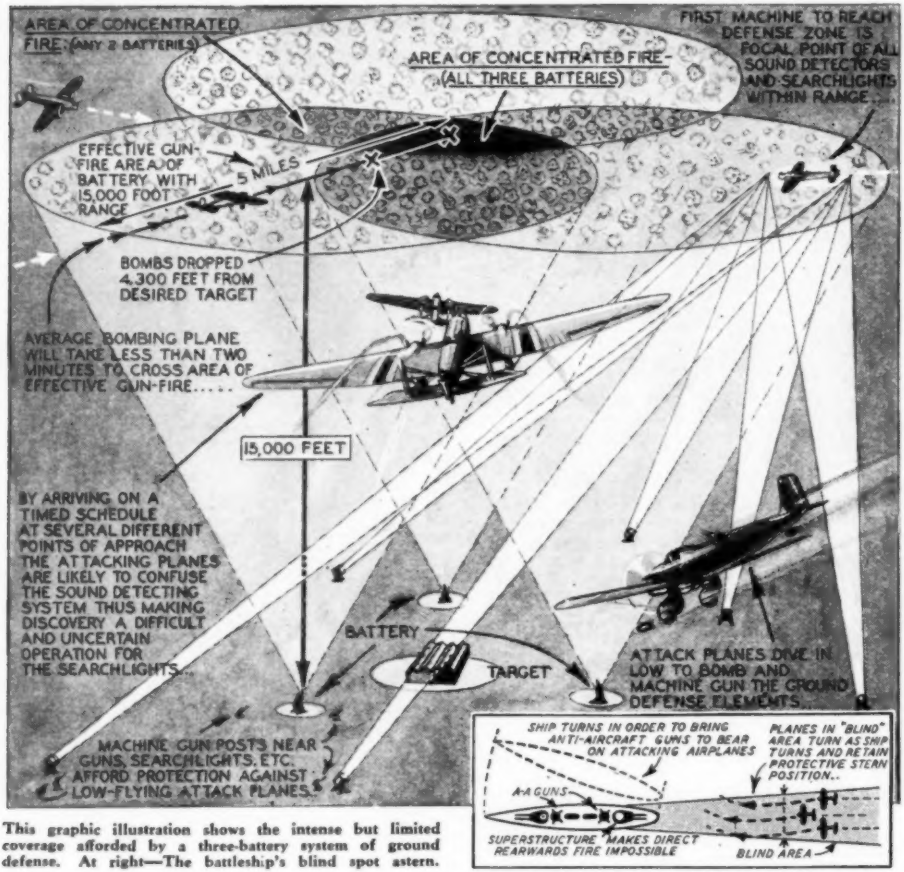
Then if it is night, the searchlights cross their beams on the oncoming planes. In daytime, the directoscope gets the heaviest use; it keeps its cross hairs of the telescopes on the planes, automatically securing and transmitting to the batteries the data with which the crews lay their guns on the aerial targets. Machine gun batteries disposed about the scene guard the instruments from low flying planes.



The brain of modern aerial defense is this Wilson anti-aircraft director. After locating the plane, it directs weapons accordingly, and with remarkable effectiveness.

Spectacular photo above shows a battery of three-inch anti-aircraft guns firing in unison at night. They are aimed and timed by the electrical fire director. In background is seen searchlight beams sweeping the sky in search of raider planes.

Bewildering Maneuvers of Enemy Planes Confuse Crews of Air Defense


AREA OF CONCENTRATED FIRE (ANY 2 BATTERIES)
AREA OF CONCENTRATED FIRE (ALL THREE BATTERIES)
FIRST MACHINE TO REACH DEFENSE ZONE IS FOCAL POINT OF ALL SOUND DETECTORS AND SEARCHLIGHTS WITHIN RANGE...
EFFECTIVE GUN-FIRE AREA OF BATTERY WITH 15,000 FOOT RANGE
5 MILES
BOMBS DROPPED 4,300 FEET FROM DESIRED TARGET
AVERAGE BOMBING PLANE WILL TAKE LESS THAN TWO MINUTES TO CROSS AREA OF EFFECTIVE GUN-FIRE.....
15,000 FEET
BY ARRIVING ON A TIMED SCHEDULE AT SEVERAL DIFFERENT POINTS OF APPROACH THE ATTACKING PLANES ARE LIKELY TO CONFUSE THE SOUND DETECTING SYSTEM THUS MAKING DISCOVERY A DIFFICULT AND UNCERTAIN OPERATION FOR THE SEARCHLIGHTS...
BATTERY
TARGET
ATTACK PLANES DIVE IN LOW TO BOMB AND MACHINE GUN THE GROUND DEFENSE ELEMENTS.
MACHINE GUN POSTS NEAR GUNS, SEARCHLIGHTS, ETC. AFFORD PROTECTION AGAINST LOW-FLYING ATTACK PLANES.
SHIP TURNS IN ORDER TO BRING ANTI-AIRCRAFT GUNS TO BEAR ON ATTACKING AIRPLANES
PLANES IN "BLIND" AREA TURN AS SHIP TURNS AND RETAIN PROTECTIVE STERN POSITION..
A-A GUNS
SUPERSTRUCTURE MAKES DIRECT REARWARDS FIRE IMPOSSIBLE
BLIND AREA

This graphic illustration shows the intense but limited coverage afforded by a three-battery system of ground defense. At right—The battleship's blind spot astern.

In the drawing showing the disposition of modern ground defense instruments, an attempt is made to defend the target with three batteries placed at points "A", "B" and "C". With the guns so arranged planes approaching in the area of converging gun fire will be subjected to intensive bombardment from at least one battery, in some cases two, and in other cases all three batteries.

The guns have an effective range of 15,000 feet and can make it exceedingly uncomfortable for planes which enter the two circles at altitudes under 18,000 feet. As it will take the aircraft, flying at 120 miles per hour, less than two minutes to cross the circles on a diameter, these guns have been placed as far apart as possible from the target, but close enough in to cross their fire over the target.

Now a plane traveling at a speed of 120 miles an hour and at an altitude of 15,000 feet, must drop its bombs 4300 yards ahead of its target to hit the mark. Fortunately, planes bent upon annihilating the targets shown in accompanying drawings can evade a large portion of the danger zone by entering the area of concentrated fire at points where the circumference of the circles bisect. They will be under fire of two batteries, but they will be less than half a minute in the danger area. Thus since the gunners have but a few moments to strike at the aerial enemy, the arrangement with only three batteries is not very satisfactory.

There are certain circumstances which may confuse the problem for the anti-aircraft defense personnel. For instance, in certain types of warships the superstructure prevents the anti-aircraft guns from being fired straight to the front or rear. Thus it is possible for planes to approach from the stern and take position to drop their bombs without being molested unless the ship changes its course. In this case the

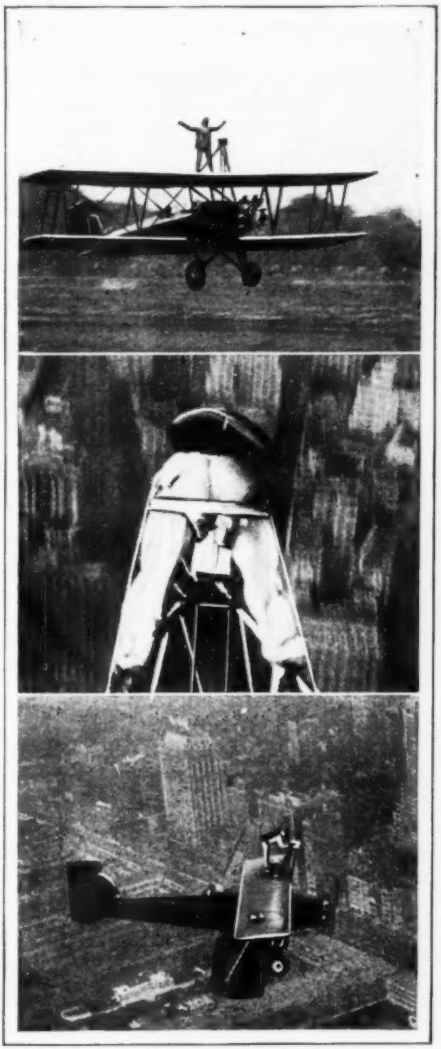
(Continued on page 152)

Cameraman Strapped to Plane Wing to Take Air Pictures

EVER wonder how some of those remarkable pictures you see on the talkie screens are produced—the kind, for instance, in which you seem to be falling from a mile in the air right down into the heart of New York City?

The series of photographs at the right will give you an idea of how it's done. The photographer was ordered to take a series of aerial pictures for Paramount News which would reproduce the visual effect that would be presented to an individual falling from a tremendous height. A tripod to which the camera was firmly fastened was secured to the top wing of the plane, and the feet of the cameraman were fitted into stirrups so that he would not tumble off when the plane dived.

The pictures taken from the wing do not show any portion of the plane and give the appearance of being a bird's eye view indeed. The cameraman wore a parachute for emergency use.



Top and bottom views show daring cameraman taking movies from top wing of plane; center view, how New York looks when you're diving down at 150 miles an hour.

Does Knee Flexibility Test Race?

A NEW method of determining racial origin has been discovered by R. F. Ross of Dalhousie University, Nova Scotia, it is claimed, involving the degree to which persons of different races can rotate their knee joints, twisting their foot and ankle to right and left when the upper part of the leg is held immovable. The average person can rotate the knee joint through an angle of 40 degrees. It was found that members of the Jewish race who were tested had less ability to rotate their knee joints than had the Gentiles, which suggests that this ability has an hereditary or racial basis. Neither gymnastic exercises nor bodily differences such as height and weight seem to have any effect in increasing this variety of suppleness.

Gym Horse From Hot Water Tank

A hot water tank mounted on pipe, as shown, makes a neat gym horse.

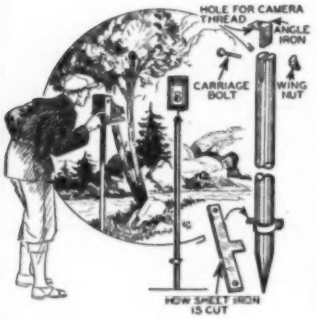
A GYM horse that can stand the weather and delight youngsters can be made and set up in half an hour by the method shown in the accompanying photograph. The pipe is readily driven into the ground, after connecting to the tank, of course. A little concrete may be poured around the pipe afterwards if greater rigidity is desired.

Nature Grows Imitation Cactus

ALTHOUGH botanists are convinced that true cactus is native only to the American continents, a recent expedition to Madagascar has discovered a plant which bears so close a resemblance to cactus that it might be considered a carbon copy. It belongs to an entirely different species, however, related to two plant families common in Central Africa. Arid conditions are supposed to have developed it.

HANDIKINKS

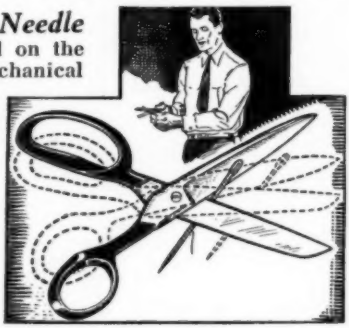
This is one of the most popular departments of Modern Mechanix and Inventions. Here you will find a variety of clever and simple stunts which will come in handy any time. Their nature is such that they are readily remembered.



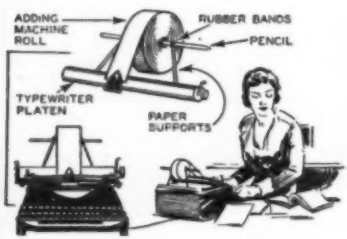
Light Weight Substitute Tripod for Hikers

TO THE paraphernalia of nature lovers, who make "camera hunting" a hobby, this light substitute for a tripod will be welcome. The one shown here embodies almost every good point of all tripods. It consists of a 5-foot length of light wood, about 1¾" in diameter. One end is given a long sharp point. Into the other end a slot is cut to a depth of 2" to accommodate an L-iron. A ¼" hole is drilled through the rod to accommodate the swivel bolt at the L-iron. A foot or so from the bottom of the rod a clamp having a protruding tongue is bolted. This clamp is used to force the tripod into the ground by foot pressure. The clamp is cut according to the pattern in the drawing. The projecting prong should be long enough so that there will be no danger of the foot slipping off and scratching ankle or socks.—T. Moore.

Sharpening Your Scissors Quickly With a Needle



THERE probably have been more kinks published on the sharpening of scissors than on any other small mechanical subject. You have read about emery stones, grindstones, steel draws, and a host of others. Now comes a new one. Sharpen your scissors with a needle! It is really a very effective method, for the steel in a needle is of high quality, is uniformly hardened, and will align the off-edges on dull scissors very well. Here's how: The needle is held lightly in the left hand, and then is placed in the open "fork" of the scissor blade. As pressure is placed in closing the "jaws" the needle is forced toward the ends of the blade. This, repeated three or four times, or even ten times, will roll off the long irregularities which dull a scissors blade.—E. F. Folger.

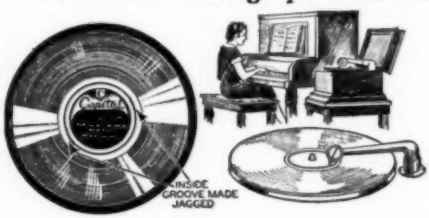


An Addressing Attachment for Typewriter

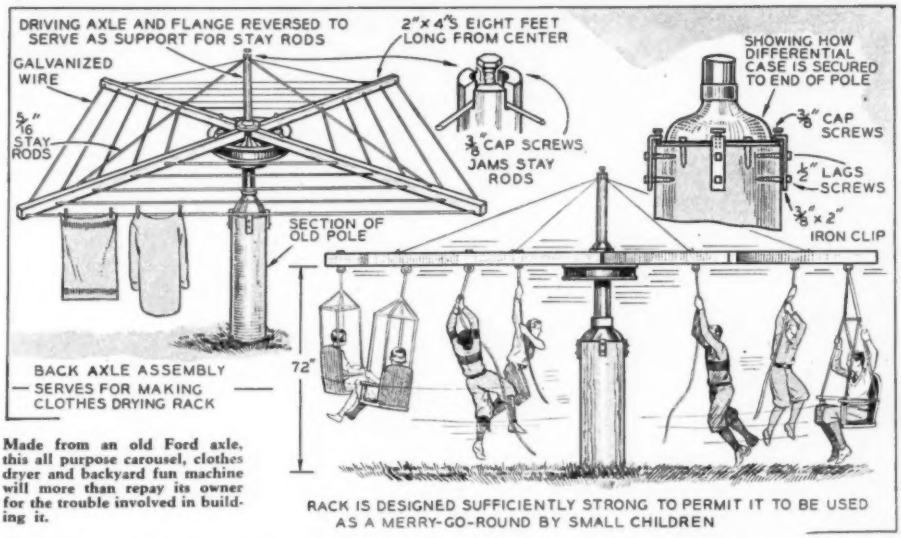
THE tedious task of making labels can be immeasurably lightened with an addition to the typewriter that any handy man can make. It consists of a roll of paper which is mounted on the turned up paper holders by inserting a pencil for an axle into the roll, and using rubber bands to hold the pencil in place. All the typist has to do is to make a list of the names as she goes along, and then snip them into little lengths on which each name is printed, making labels later from the roll.—Romauld Neiss.

Handy Metronome at Low Cost From Discarded Phonograph Records

ON THE inside of most records there will be found an endless circle. By making this groove jagged for about ⅜" with the point of a knife, a needle will give a beat every 1/78 per minute. The machine can be regulated at will. If more beats are needed, better put multiples equally spaced about the groove. For instance, with the disc turning 60 r.p.m., you can get 120 beats by putting two evenly spaced jags at points equidistant about circumference of record.—C. Lantz.



Playtime Gadgets from Old Parts


DRIVING AXLE AND FLANGE REVERSED TO SERVE AS SUPPORT FOR STAY RODS
2"x4"S EIGHT FEET LONG FROM CENTER
GALVANIZED WIRE
5/16" STAY RODS
3/8" CAP SCREWS JAMS STAY RODS
SHOWING HOW DIFFERENTIAL CASE IS SECURED TO END OF POLE
3/8" CAP SCREWS
1/2" LAGS SCREWS
3/8"x2" IRON CLIP
SECTION OF OLD POLE
72"
BACK AXLE ASSEMBLY — SERVES FOR MAKING CLOTHES DRYING RACK
RACK IS DESIGNED SUFFICIENTLY STRONG TO PERMIT IT TO BE USED AS A MERRY-GO-ROUND BY SMALL CHILDREN

Made from an old Ford axle, this all purpose carousel, clothes dryer and backyard fun machine will more than repay its owner for the trouble involved in building it.

THESE crowded city backyards present quite a problem to the lady of the house who has kids, washing and housework to watch all at the same time. A Kansas City housewife conceived the idea of making a clothes dryer out of a Ford rear axle to make use of her limited backyard space, and her husband in developing the idea seized upon it as an opportunity to build a plaything for the children at the same time, the result being the all purpose machine shown in the drawings above.

The driving axle and flange of the wheel were reversed to serve as supports for the stay rods, and the ½ axle mounted wheel and all in a vertical position. The half of the differential housing serving as a support for the wheel and axle was held down to the stump of a post by half inch lag screws going through ⅜"x2" iron clips. Two 2x4's eight feet long were disposed about the vertical axle using the wheel as a resting flange and the axle flange as top retainer.

The stay rods running from the top of the axle post were led from one side to the other through a castellated cut made in the head of the rod. See drawing.

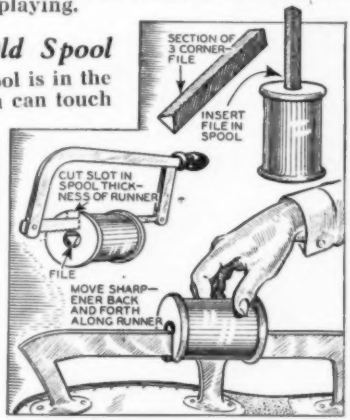
Galvanized wire was found to make the best clothes hanging. Rope would sag, and the ordinary wire would leave rust marks, so galvanized wire was adopted.

Stout through-bolt screw eyes were run into the arms and small pieces of ¾" manila rope run through to a point which would be waist high in the youngsters.

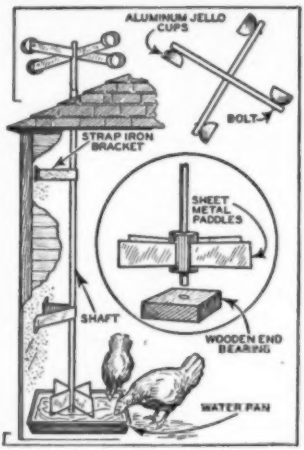
This will allow them to make a running carousel or merry-go-round which they can use for playing.

And Here's Another New Use for an Old Spool

ONE of the most practical of new uses for an old spool is in the making of a good skate sharpener with which you can touch up your skates right on the ice if it happens to be sandy or gritty. Take a good hardwood spool of the variety which comes with the five cent linens and cut down through the hole with a hack saw so that there is a pinch fit for a three cornered file. Break the file in a vise to a length little less than the spool. This will prevent the ends from tearing the lining of your pockets. Glue the file into the wood. The serrations on the back will make a good anchorage for the glue. To sharpen the skate, draw the file along the edge of the runner as many times as necessary. Clean the file after each sharpening to preserve its effectiveness. If you are clever at toolwork you can put a rat tail file in another spool and thus you'll be able to hollow grind your skates which is much more effective.


SECTION OF 3 CORNER FILE
INSERT FILE IN SPOOL
CUT SLOT IN SPOOL THICKNESS OF RUNNER
FILE
MOVE SHARPENER BACK AND FORTH ALONG RUNNER

New Stunts for the Farmer

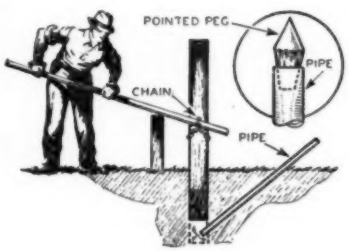


Wind Keeps Poultry Fount From Freezing

TO THE person who keeps just a few hens in an unheated coop this device will prove a great labor saver in winter time. Instead of relying on heat and the attendant trouble it involves, I have made a water stirrer with a funnel wind motor. The only materials necessary are a ¼" iron shaft long enough to reach from the floor pan to the roof and through to a good breeze; 4 Jello cups, obtainable at the 10c store; a few small sheets of thin metal for brackets and paddles; and a few scraps of soft wood for the blades of the fan. These are assembled as the drawings show so that the night breezes agitate the water and prevent it from freezing. It doesn't matter if there isn't much wind. One or two stirs is sufficient to prevent ice.—R. Anderson.

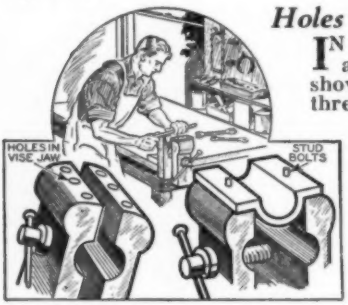
Here's a Kink for Pulling Old Fence Posts

OLD fence posts have a way of becoming so imbedded that it is impossible to yank them out of the ground unless some fancy engineering is resorted to. Here is a way I found to do the trick. I found that the reason that old poles stuck was because the mold around the bottom is such an effective seal that you have to get air in the vacuum to get them out. I drove a pointed peg into an old pipe, aimed it at the bottom of the post, drove the peg out, let air in, and out came the old post!—Wink Thornley.



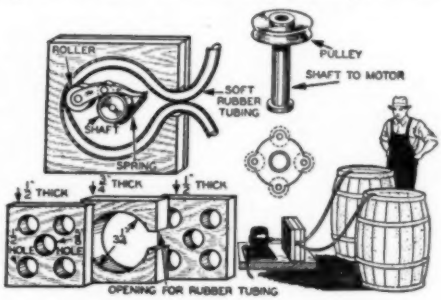
Holes Materially Increase Usefulness of Vise Jaws

IN a local garage here one of the mechanics took his vise and bored several holes in each jaw in the manner shown in the drawing. These holes were tapped and threaded and some short stud bolts to fit were kept handy at the bench. In holding such articles as bearings or caps or other flat work that has a hole or two in it the cap is laid on top of the vise jaws in the manner shown and stud bolts screwed in the holes. This holds them securely while the bearing is scraped or other work done on it. These studs will be found exceptionally handy for a number of other purposes such as bending iron, or bending eyes of small rods, holding wood stock and for dozens of other every day uses.—A. Waychoff.

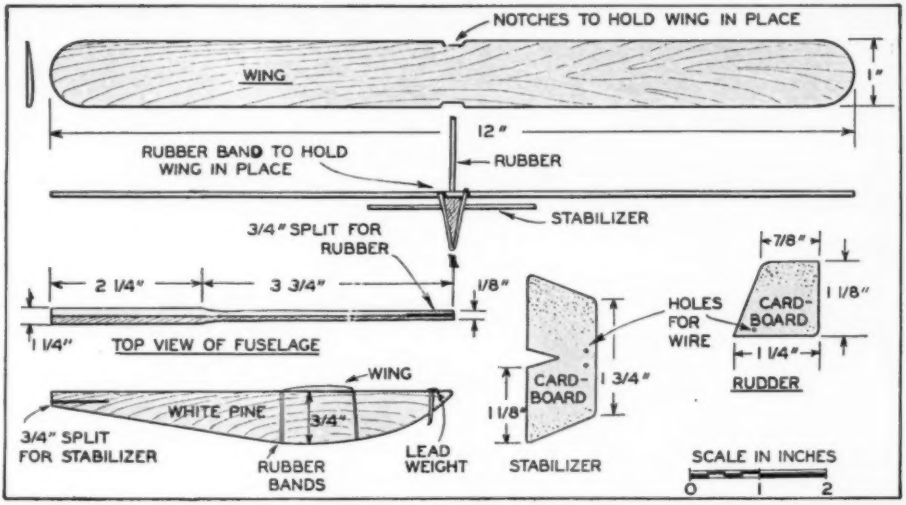


A Practical Water Pump That Is Easy to Make and Very Inexpensive

AN INGENIOUS and practical little water pump can be made of a few simple parts at almost no cost whatever. The tube is a piece of soft rubber about three-eighths of an inch in diameter. The casing as shown is made of three boards. The center part is the roller out of a Ford timer. There is a shaft which is used for driving the pump from a motor. See drawing. In place of the timer rotor a board with four rollers in it will give a more even flow of water. Pumps using this principle are in use in many different industries, where it is desired to pump glue or other liquids which would give trouble because of a packing joint.—C. M. Murnane.



Ideas for the Dabbler in Woodwork



This 12-inch soaring glider is made of ordinary white pine which, unlike balsa wood, can be secured in any locality.

HERE is a glider which can be made by any one. It is not necessary to have at hand a stock of balsa wood, which to some is as hard to get as jade. Ordinary white pine and cardboard constitute the materials, and the fastenings are in the form of rubber bands.

Start construction with the wing. This should be an eighth of an inch thick and worked down to a good airfoil section as the drawing shows.

It can be rounded off to this airfoil section with sandpaper.

There are notches in the leading and trailing edge which are used to hold the wing in place on the fuselage.

The fuselage is made of white pine, too. The tail end of the fuselage should be ¼" square for a distance of 2¼" from the stern end. The balance of the fuselage should be ¾" deep and about ⅛" thick. A small lead weight will be necessary. It can be filed and graduated until it gives the glider just the characteristics it should have. The idea is to have the ship a little nose heavy.

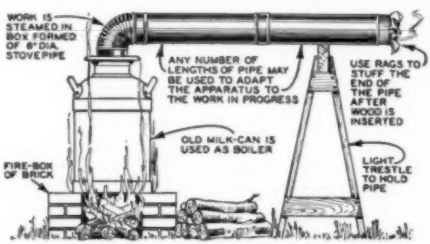
Then the tail surfaces must be made. These are of cardboard. A small piece of wire is used to staple the stabilizer and the rudder to the fuselage.

Select a fair day for the trials. It is best to use an open field without any houses or trees about, as these tend to introduce currents which on a test flight are hard to distinguish between defects in the air and defects in the glider.

Hold the ship at her balance point, which should come ⅓ of the chord from the leading edge. Shove her off and watch her go!

Ingenious Steam Box Easily Made From an Old Milk Can and Stove Pipe

YOU men who are always building things of wood, whether it be an airplane or a boat, are many times hard put to it to cook up a good steam box from the odds and ends which may be lying around, eh what? Well, ingenious MM & I reader, J. R. Asplund, of Eatonville, Washington, sends us this gag which we nominate for the month's best. Asplund says: here's the way I steam material for such things as boat ribs, wing tips, etc. I take a five or ten gallon milk can, fill it half full of water and then insert a five or six inch stove pipe elbow in the top of the can and then connect to the elbow as many lengths of pipe as is needed for the wood to be steamed.

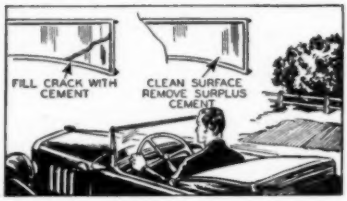

WORK IS STEAMED IN BOX FORMED OF 8" DIA. STOVEPIPE
ANY NUMBER OF LENGTHS OF PIPE MAY BE USED TO ADAPT THE APPARATUS TO THE WORK IN PROGRESS
USE RAGS TO STUFF THE END OF THE PIPE AFTER WOOD IS INSERTED
OLD MILK-CAN IS USED AS BOILER
FIRE-BOX OF BRICK
LIGHT TRESTLE TO HOLD PIPE

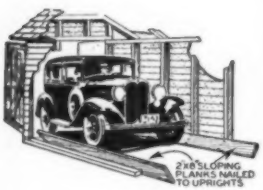
Then build a fire around the can, soak the material to be steamed in water so that it heats better, and then plug the end with rags. In a few minutes the wood will be pliable. One should wear canvas gloves to protect the hands.

Motoring Ideas for the Autoist

Repair Crack in Windshield With Cement

A LONG crack in a broken windshield may be repaired satisfactorily without impairing the vision of the driver and without the unsightliness of a lot of white tape along the crack. This may be done by placing a strip of tape along the crack on one side of the windshield only. Fill the crack with china glass cement, working from the other side of the glass. Remove tape and clean the surface with a razor blade and you have a fine repair.—Everett Folger.



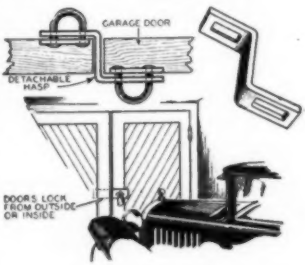


Guard Planks Save Hubs and Fenders of Auto

IN a narrow garage it is almost impossible to not sooner or later smash a fender or rip off a hub cap. Or else mar the paint and finish. To overcome this a couple of two by eights as long as the traversed run of the car in the garage were laid the length of the garage and sloping as shown, the bottom part on the floor being about one inch greater in tread than on the wheels. This makes a guide that keeps the wheels in a straight line and prevents the tires from being cut by other forms of guides.—A. H. Waychoff.

Locking the Garage Door From Either Side

OWNERS of garages, particularly those located on lots at the rear of the home, will be interested in the simple solution of locking means for the doors shown in the attached illustration. By means of the double ended hasp and double lock hooks, it is possible to lock or open the garage doors from either the inside or outside. As shown by the sketch, the Z shaped hasp secures to the inside of one door and the outside of the other. To use this arrangement, a regular padlock can be used on the outside and either a wooden or steel dowel pin can be used inside. If desired, however, two locks can be used, these being duplicates so that one key will fit either.—G. A. Luers.



Here Are Several Excellent Cold Weather Starting Kinks for Motorists

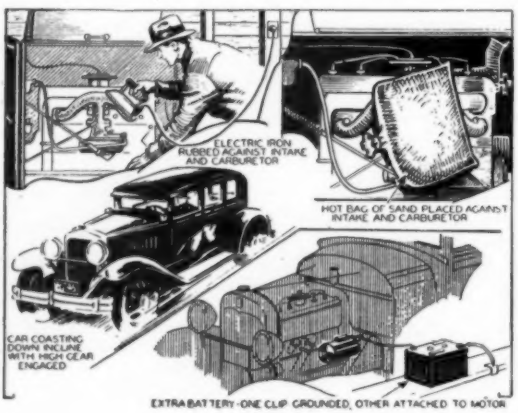
THERE are three things which generally keep a car from starting in cold weather. One of these things is the increased viscosity of the oil. Another thing is the cold intake manifold which condenses the incoming mixture. The other thing is weakened battery through near freezing temperatures which destroys electrical efficiency to a certain degree.

Here are ways to lick this problem. One is to put an electric flatiron on the manifold and let it heat the incoming charge of gas. This will often do the trick alone. A bag of hot sand will often do the work quite as well.

When trying to start the car by coasting down hill, always use high gear. This turns the motor over slower and uses less of the car's momentum.

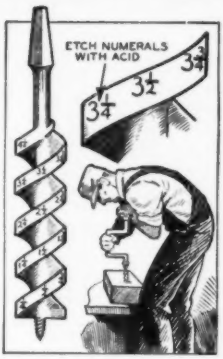
If the oil is thick there is nothing much you can do but use lighter oil, and in the emergency hook up another battery in multiple with the one in the car. See drawing at left.

Several things must be borne in mind when starting a car. One is you can never flood a cold motor, but if you have had the car running and the gas thins out, be very careful in your use of the choke. Another is to keep the spark on far retard, especially if hand crank is used to start motor.—R. E. Telke.


ELECTRIC IRON RUBBED AGAINST INTAKE AND CARBURETOR
HOT BAG OF SAND PLACED AGAINST INTAKE AND CARBURETOR
CAR COASTING DOWN INCLINE WITH HIGH GEAR ENGAGED
EXTRA BATTERY-ONE CLIP GROUNDED, OTHER ATTACHED TO MOTOR

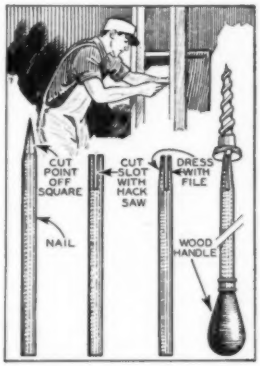
Workshop Kinks for Handymen

This Bit Accurately Measures Its Own Hole Depths



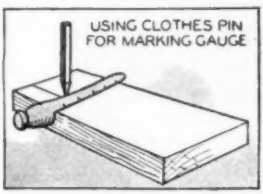
THERE are a lot of gadgets on the market for determining the depth which a bit may be driven to when you are drilling for mortises or dowels or plugs. But why monkey with a stop? The bit can be its own rule. Measure off the distances and fractions on a piece of paper, and scribe them about the circumference of the bit. Then with a punch or with acid you can mark the dimensions and have a drilling bit ready for this kind of service without attachments. Simple, eh what?—Altamount Cole.

Nail Makes Handy Screwdriver



HERE is a rough sketch of a little tool I made out of a nail which I find almost indispensable for starting small screws in tight places. The nail is cut off square and sawed lengthwise for about ½". Then the round sides are dressed off lightly to form a square surface, care being taken not to file too much. A slight pressure of thumb and forefinger will allow the tool to be inserted in the screw head, where it hangs on surprisingly. A small wood handle may be added for convenience in handling. The size nail to use depends upon the screws for which it is intended. The tool is not intended as a screwdriver but only as a tool for starting screws in inaccessible places—a counterpart of the function performed by tack hammers with nails where the heads are made magnetic until you can get in there with a hammer and bang and pound away so the thing is given a start.—Walter Brixius.

Clothespin Makes a Convenient Marking Gauge



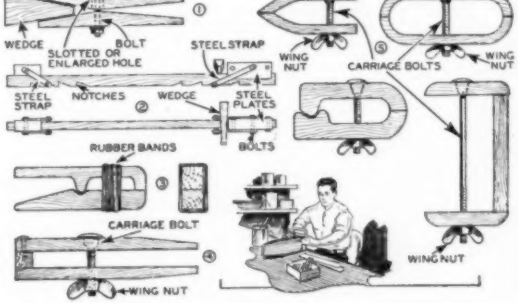
SAW off the leg of one side of a clothespin and you have the greatest little makeshift marking gauge you ever saw. For ripping out lumber, for transcribing dimensions from one piece to another it is hard to equal. The remaining leg should be planed flat so that one of the edges can be marked out with a rule equivalent to that on an ordinary carpenter's rule. The edge of the shoulder is left square, and the tool will serve as a rule of thumb square for pocket carrying.—Ted Allen.

Sam Rabl's Hints on Making a Variety of Simple Clamps for Workshop

OFTTIMES around the cellar or garret workshops a job crops up that necessitates a number of clamps.

Possibly the oldest and simplest form of wooden clamp that can be easily made by the home woodworker is the wedge clamp. This consists of two pieces of wood held together by a bolt as in Fig. 1 and a wedge which when driven in tightens the other end of the clamp. This type of clamp has been used from time immemorial by the builders of lap strake boats to pinch the planks together when they are riveting them together.

A variation of this type of clamp is shown in Fig. 2 and which is used to clamp boards together while gluing such as a table top. A long bar is notched on the bottom as shown in the drawing and two blocks are made of the same thickness material as the bar to form the jaws of the clamp. Four steel straps are made to take the thrust of the jaws as illustrated and on the jaw that is on the wedge end, two metal plates are fitted to prevent the jaw from moving sidewise when the wedge is driven home. The notches along the bottom of the bar prevent the jaws from slipping and enable the clamp to be adjusted conveniently and quickly to any required width.



Making Pictures Without

Here we have an original picture created by the "photogenic" method described below. Artistic inventiveness of the individual is given full range in this method of picture reproduction. Foliage was made from roughly torn papers.

LAMB MADE FROM PIPE CLEANERS
BIRD, TREE AND LAND-SCAPE TORN FROM WHITE PAPER
Spirit of Spring
LETTERING IS WHITE PAPER, OUTLINE OF WHICH IS FILLED WITH BLACK INK

Units out of which "Spirit of Spring" was composed prove to be simple. Except for the pipe-cleaner lamb, everything is cut or torn from white paper, as used for typewriting.

OF LATE weeks a method of making pictures without a camera by placing suitable stencils, small trinkets or transparent objects directly on the surface of sensitized photographic paper, has begun to attract attention. It offers an amazingly broad field of action to the artistic amateur, although it is by no means a brand-new method—having, in fact, been used years before the invention of the camera.

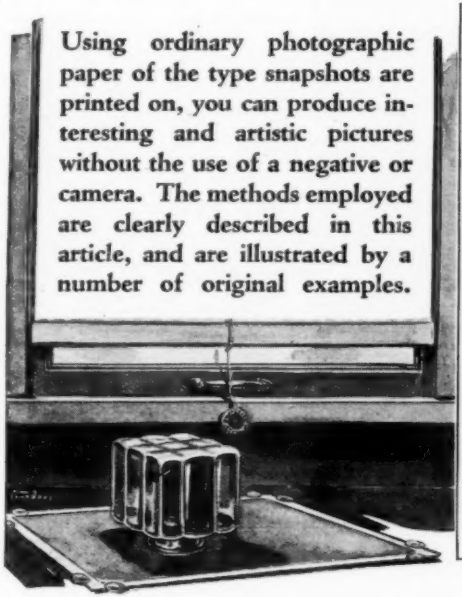
Almost any kind of photographic paper may be used for this type of work, but it is well to avoid the faster bromide, or enlargement papers, because of their great sensitivity, thereby necessitating the use of a safe light and dark room, and also calling for very short exposures compared to those required by slower papers. In some cases this rapidity may be a distinct advantage, particularly when fairly opaque leaf forms or similar objects are to be recorded, with all of the fine detail in the veins and stems showing.

Probably the most convenient paper for the beginner is the material known as "printing out paper," which darkens when exposed to light and requires no developing, and no dark room if intelligently handled. There are several reliable brands of this paper obtainable at most of the larger photo dealers. All of the illustrations for this article were made on such a paper, and working instructions are included with each package.

a CAMERA ~

by PROF. FRANZ FLUGEL

Using ordinary photographic paper of the type snapshots are printed on, you can produce interesting and artistic pictures without the use of a negative or camera. The methods employed are clearly described in this article, and are illustrated by a number of original examples.



Weird crystal patterns and fanciful shapes can be secured by printing through diamonds, glassware, lace, and similar articles. The reproduction above was made by placing an ink bottle upside down on the printing paper, permitting light to strike it from the side, as indicated at the left.

After the idea for a suitable design has been worked out and the necessary stencils, leaf forms, glass objects, etc., have been prepared, the shade should be carefully drawn for further operations, and no outdoor light allowed to enter the room either directly through the window, or by reflection from walls in other rooms.

No Dark Room Needed

It is usually entirely safe to handle the paper by average diffused electric light within the room, but the more rapidly the work is executed the less danger there is of an over all fog or darkening of the sensitive surface. If a printing frame is available it is well to use it, but excellent results may be had by simply laying a sheet of the sensitive paper on a flat table top and placing small weights on the corners to prevent any disturbance by air currents, and to minimize the tendency to curl.

Printing by Daylight

The composition should be suitably arranged on the surface of the paper, taking care that the emulsion or sensitive side is up. The curtain may now be raised and the daylight allowed to strike the paper, when it will be seen that the paper rapidly darkens, and when it has become sufficiently dark the shade may be lowered and the paper put in the fixing bath, which prevents further darkening when exposed to light. Diffused daylight can be used but it is much slower than direct sunlight, and the shadows are apt to be rather diffuse and lacking the sharp edges obtainable with sunlight.

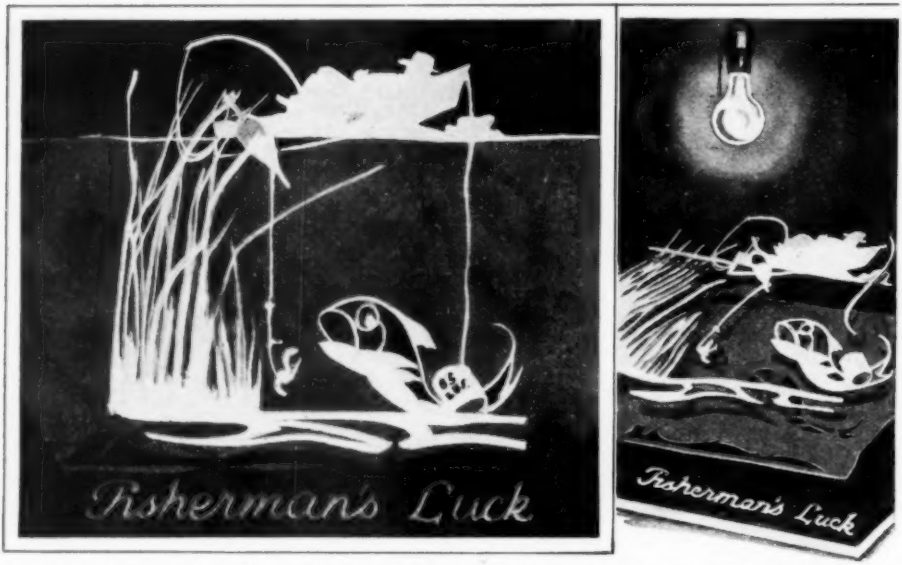
Let's take as a specific example the "Spirit of Spring" picture which illustrates this article. The spring lamb was made from three pipe cleaners twisted together into suitable shape, while the bird was cut with shears from paper. A sheet of 8x10 photographic paper was placed under the design and the lamb, bird, foliage, etc., shifted until a pleasing composition was arrived at. Then the exposure was made.

Double Exposure

The title "Spirit of Spring" was lettered by hand on typewriter bond paper, outlining the letters with a fine pen point and India ink, and filling in the background with India ink so that the paper when held up to the light showed only the white letters against a black background. This stencil, or hand drawn negative, as it may be considered, was placed over the already exposed spring scene and a second exposure made, this time only the words "Spirit of Spring" printing through.

Another illustration shows what might be taken for a study in crystallography or some scientific sleuth's X-ray of the evidence in a gem theft case. However, it is

Artificial Light Recommended for Printing Because of Uniform Results



Another ingenious example of photogenic artistry. Printing can be done by daylight, but artificial light is to be preferred because its uniformity makes it easier to calculate correct exposure times after a few experimental efforts.

neither a crystal nor the work of a Sherlock Holmes, but merely a cheap glass inkwell. Notice the well defined ring where the top of the ink stand rested upon the paper.

No exact directions can be given for the time of exposure required, for the intensity of daylight varies tremendously with latitude, time of year, time of day and atmospheric conditions, and the speed of different makes of paper varies considerably.

If one has a nitrogen filled electric bulb it is possible to use this as a light source, or better yet, a small arc lamp, and then when the exposure time has once been determined with the paper at a given distance from the light source, it is easy to make further exposures with assurance of success. Remember that the intensity of the light striking the paper varies inversely as the square of the distance from the light source, so that if the light is held one foot from the sensitive surface for a given time and then another exposure is made with the light twice as far away, the exposure required will not be twice the first exposure time but four times as long.

Tips on Artificial Lighting

A few trials will speedily determine the proper exposure time and a convenient method of working. It must be borne in mind that although a much shorter exposure is possible with the lamp close to the paper, shadows are not as sharp as they would be if the lamp were a greater distance away, and if the lamp is too close to the paper there is a possibility of the filament giving irregular patches of light, with a falling off of illumination toward the edge of the paper when large pictures are being made. Unpleasant heat and glare are other disturbing factors when working too close to high power lights.

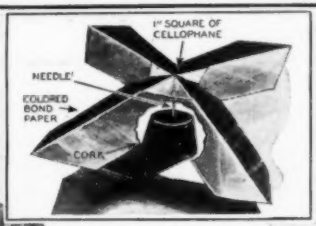
Direct Prints of Leaves

Strikingly beautiful designs can be made by this method of "photogenic drawing" and unusual ideas will present themselves immediately to the reader who has a flare for the creative. The use of multiple exposures combined with irregularly shaped glass objects, fabrics, lace, and plant forms from nature, allow him amazing excursions into the land of symbolism and the abstract, unhampered by technical barriers, with a limit determined only by the ingenuity of the artist.

An interesting variation is to make prints directly from leaves and ferns. The best technic is to press the leaves or ferns between book leaves until they were flattened out, but not long enough to dry, for when dry they become more opaque and delicate leaf structure is not well reproduced. The leaves should be pressed sufficiently to remove excess moisture and then arranged on the glass of a printing frame, where they may be shifted around until a pleasing composition is obtained. Before exposure the leaves can be stuck to the glass with a drop of mucilage here and there in order to prevent slipping, and the sensitive paper then placed in the frame and exposed.

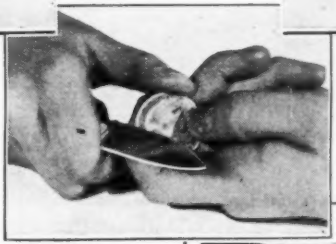
Try your hand—and good luck!

"Impossibilities" MYSTIFY Party Guests



Here's how the "Black Friars Cross" is made. A 4-in. cross is cut from bond paper and 1-in. squares of cellophane cemented in center. Needle embedded in cork supports the rotating cross.

Unexplainable by science, the "Black Friars Cross" revolves at rapid rate when the hand is cupped around it as illustrated here. When the hand is removed the rotation ceases. The other hand will then cause it to revolve in the other direction. The speed of rotation will be found to vary with different people at party. Coldness or warmth of hand will not affect the "cross," and neither will magnetism or breath. Make sure it is well balanced for the trick.



Above—Performing the "Blood of St. Januarius" trick. Chemicals cause "dried blood" to boil to top when container is held in hand. Left—Nicking half dollar. Side which is nicked falls with "plop" when coin is pitched in air. With little practice you can call heads or tails to bewilder the spectators at the party.

ONE of the most startling mysteries of ancient Rome was the "Blood of St. Januarius" which was preserved in a dry state for ages and which had the baffling ability to become liquified instantly when a cup of the substance was held in the hand.

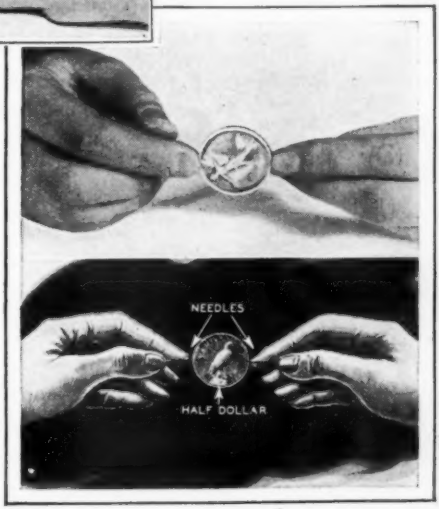
Science is now able to duplicate this stunt, and it can be exhibited at a party to mystify guests. A cup of sulphuric ether is given a red color with alkanet root, and sufficient spermacetti added to solidify the liquid.

At ordinary temperatures this liquid resembles dried blood, but when held in the hand it quickly liquifies and boils up to the top of the containing vessel, to the amazement of all spectators.

Another surprisingly simple stunt to astonish guests is the "Black Friars Cross," which even science can't figure out. Fold a 4 in. square of bond paper twice, trimming it to the shape illustrated in the drawing above. A 1-inch square of cellophane is then cemented on the exact center on either side and the completed cross balanced on the point of a needle embedded in a cork.

Cup the right or left hand on the table near the cross and in a moment it will begin to rotate, first slowly, then faster and faster. When the hand is removed it will stop. Why? Nobody knows. The speed of rotation varies with different people, so it must be concluded that some mysterious emanation accounts for the cross's strange conduct.

Here's another brain teaser. With a knife cut a nick in the edge of one side of a half dollar. Then when it's flipped up you can tell by the sound whether it lights heads or tails. If it stops on the nicked side you will hear a sudden "plop." A little practice will make perfect. A pair of needles stuck into the edge of a coin and concealed behind the thumbs will enable you to rotate a coin apparently between your forefingers.



Coin poised between forefingers will revolve when blown upon. Secret of the trick is pivots of needles concealed behind the thumbs and stuck into the edge of the coin.

Plans for the GERE

This excellent photo of the Gere Sport Biplane speaks for itself. Good design, clean lines and beautiful workmanship.

PART II

This second and final installment of plans for building the Gere Sport Biplane takes up details of the wings, tail assembly, controls, and control surfaces. When you've finished your ship you'll have a light biplane that is the last word in modern design.

IN CASE you fellows who have followed this article think I am hipped on the subject, let me confess to a weakness for biplane design. Amateur builders as a rule do not have very much flying time behind them and therefore need a plane which will stand a good deal of banging about. Now, rightly or wrongly, most training ships are of the biplane type and from this we may assume that the type is particularly well suited to hard usage if not actual abuse. Certainly it can combine rugged strength with low weight—two factors which are of supreme importance in any light plane design.

"The writer's purpose in designing this plane was to make a light plane that would perform like the ordinary commercial or training plane and be of modern design and construction throughout the entire structure . . . the factor of safety of ten is maintained throughout and is greater in many places" (from the unfinished notes of George [Bud] Gere).

After reading Bud Gere's stated reason for designing and building this ship and after digesting the plans and pictures which accompany this article there is little doubt in my mind that you will feel inclined to agree that he just about hit the mark.

As mentioned in the previous installment, everything has been done to try and make the accompanying working drawings self-explanatory. It has also been explained that through unfortunate circumstances the builder of the original ship was unable to complete the plans himself.

Now it is literally impossible in the limited space at our disposal to cover every single detail of any airplane design and the prospective builder must be prepared to exercise a certain amount of ingenuity and generally use his own head. These remarks are particularly directed to those who may feel the urge to write in and complain that I have not covered the entire ship.

My personal opinion is that builders will always take certain liberties with one or more details of the design they are reproducing; and for various reasons, not the least of

Editor's Note: As explained in the previous installment of this article, George (Bud) Gere, Jr., who designed this plane and built it nearly to completion, was killed in an ice-boat accident shortly before the ship was ready for test flights.

The plane was completed through the efforts of his father and friends who had worked with Bud, and was test flown last fall by Elmore Wall, Twin Cities pilot, who pronounced it one of the finest light planes ever designed—in which statement he echoed the sentiments of many other pilots fortunate enough to examine and fly the plane.

The original Gere biplane has been acquired by the University of Minnesota, where it is now being used in teaching classes on aeronautical design.

Sport BIPLANE

by Douglas Rolfe

which is the desire to incorporate some little improvement of their own—fancied or real—into the finished job. Which seems to me a healthy attitude deserving nothing but praise *so long as the important features of the design are not tampered with.*

For the builder who is tackling his first job and who therefore is rather at sea when it comes to tackling some of the construction operations I can think of no finer advice than to recommend the purchase of a copy of the 1932 Flying Manual. This is literally a mine of information and contains not one but several airplane building articles. Written as they are by different designers and specialists, these articles are of unusual value to the amateur builder and a careful perusal of this volume will put the reader in possession of just about all the written knowledge necessary to build the Gere plane from the plans furnished here.

Now having got that off my chest let's proceed with the work in hand:

The Wings

You will see by the drawings and photographs that the wings are cut off square at the tips. This eliminates the making of curved tips, which are hard for most amateur plane builders to make all alike. There is so little loss in dynamic effect in using a flat tip on a plane of this size and type that the additional work involved in making curved tips is not warranted.

The spars are designed large enough to permit the use of pine if spruce is not available, but spruce is recommended. They are 1" thick. The depths of front and rear spars respectively can be obtained from the working drawings. The spars are not routed to form I beams, as difference in weight is so slight that it would not pay to have it done in a mill and to rout them by hand is a tedious operation requiring a good deal of time and care. Top and bottom edges of the spars should be beveled to meet the form of the rib, this operation naturally being delayed until after the ribs have been made. While making the wing spars it would be a good plan to make the center section spars, one front and one rear, following the drawings for length.

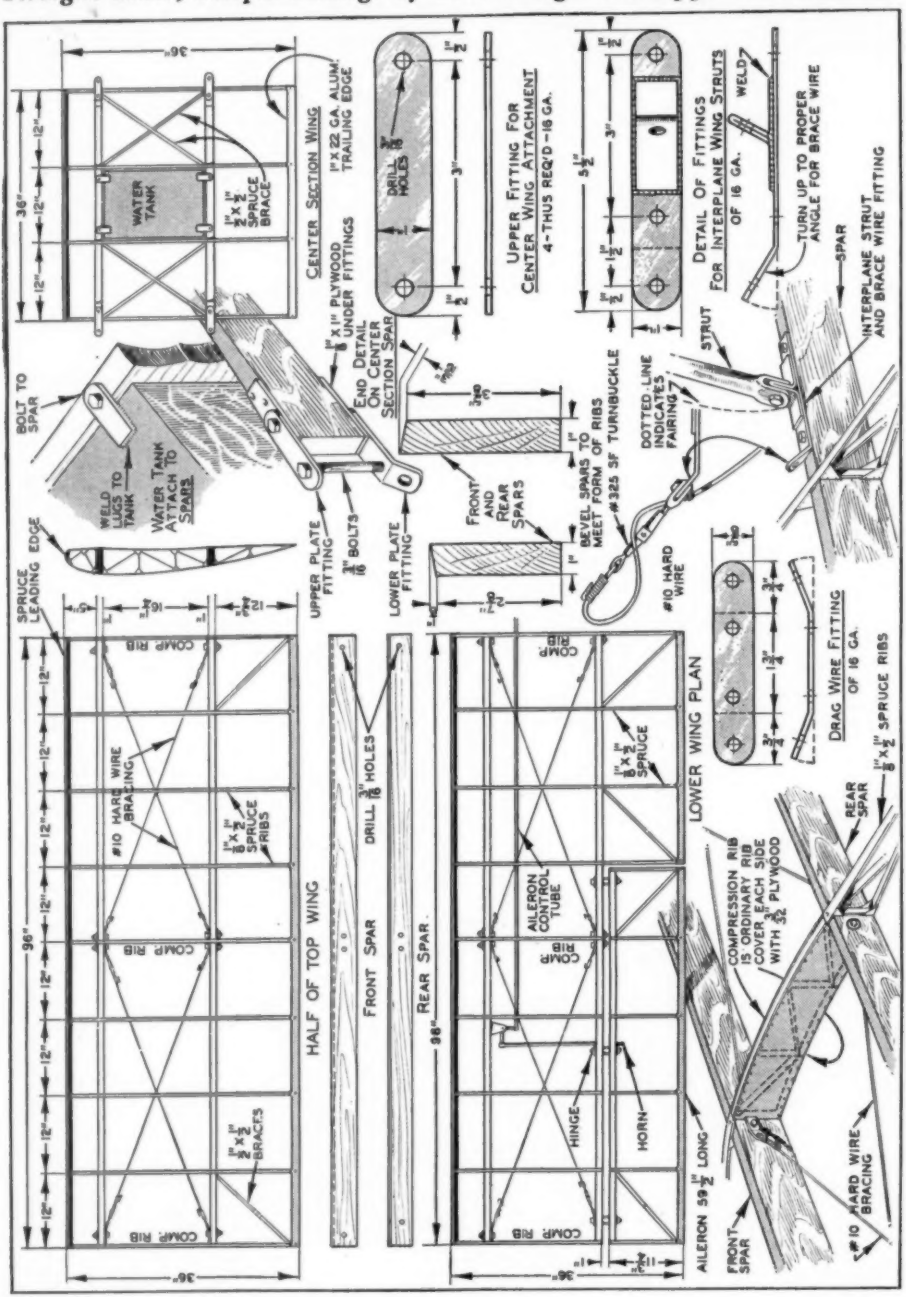
A good view of the wing construction. It is suggested that 20-gauge steel wire be used for the false ribs instead of shaped aluminum, as used on the original job.

Wing Ribs

Each of the two upper wings requires nine full ribs, the two lower wings will each

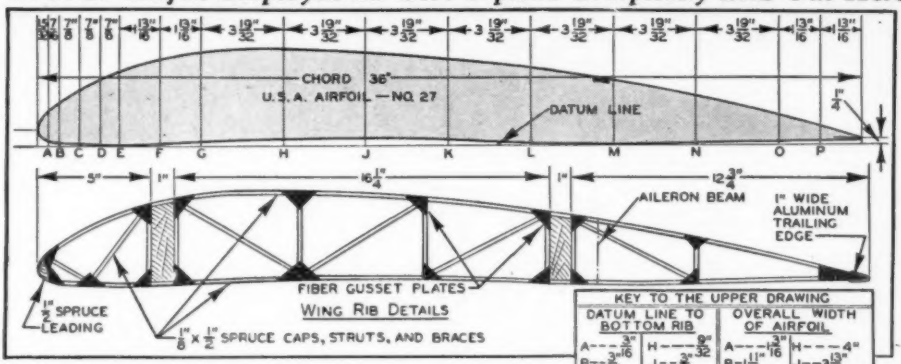
This picture was snapped at Wold-Chamberlain airport just after the plane had won her wings in a successful test flight. George Gere, Sr., is seen congratulating pilot Elmore Wall on his expert handling of the plane designed and built by his son.

Straight Lines, Simple Fittings of Gere Wings Will Appeal to Amateurs


CENTER SECTION WING
WATER TANK
1" X 1/2" SPRUCE BRACE
1" X 22 GA. ALUM. TRAILING EDGE
1" X 1" PLYWOOD UNDER FITTINGS
DRILL HOLES
UPPER FITTING FOR CENTER WING ATTACHMENT 4-THUS REQ'D-18 GA.
DETAIL OF FITTINGS FOR INTERPLANE WING STRUTS OF 16 GA.
WELD
TURN UP TO PROPER ANGLE FOR BRACE WIRE
SPAR
INTERPLANE STRUT AND BRACE WIRE FITTING
STRUT
DOTTED LINE INDICATES FAIRING
BOLT TO SPAR
WELD LUGS TO TANK
WATER TANK ATTACH TO SPARS
END DETAIL UNDER CENTER SECTION SPAR
FRONT AND REAR SPARS
BEVEL SPARS TO MEET FORM OF RIBS
#325 3F TURNBUCKLE
#10 HARD WIRE
UPPER PLATE FITTING
BOLTS
LOWER PLATE FITTING
SPRUCE LEADING EDGE
COMP RIB
#10 HARD WIRE BRACING
1" X 1/2" SPRUCE RIBS
1" X 1/2" SPRUCE BRACES
HALF OF TOP WING
FRONT SPAR
DRILL 3/16" HOLES
REAR SPAR
LOWER WING PLAN
1" X 1/2" SPRUCE
AILERON CONTROL TUBE
HINGE
HORN
AILERON 59 1/2" LONG
DRAG WIRE FITTING OF 16 GA.
1" X 1/8" SPRUCE RIBS
REAR SPAR
COMPRESSION RIB IS ORDINARY RIB COVER EACH SIDE WITH 3/32" PLYWOOD
FRONT SPAR
#10 HARD WIRE BRACING

Working drawings of the wings and center section are given here. Note the position of the surge tank in the middle panel of the center section. A further improvement would be to place this tank on one side and the gas tank on the other. The center panel could then be braced as shown in the drawing. Tips of the wings are square for simple building.

U. S. 27 Airfoil Employed on Gere Biplane Completely Laid Out Here


CHORD 36"
U.S.A. AIRFOIL — NO. 27
DATUM LINE
A B C D E F G H J K L M N O P
AILERON BEAM
1" WIDE ALUMINUM TRAILING EDGE
FIBER GUSSET PLATES
WING RIB DETAILS
1" SPRUCE LEADING
1/8" x 1/2" SPRUCE CAPS, STRUTS, AND BRACES
KEY TO THE UPPER DRAWING
DATUM LINE TO BOTTOM RIB
OVERALL WIDTH OF AIRFOIL

The Gere rib is very strong and follows modern construction practice. Compression ribs are formed by covering ordinary ribs on each side with 3/32-inch plywood. Use this drawing in laying out a rib jig.

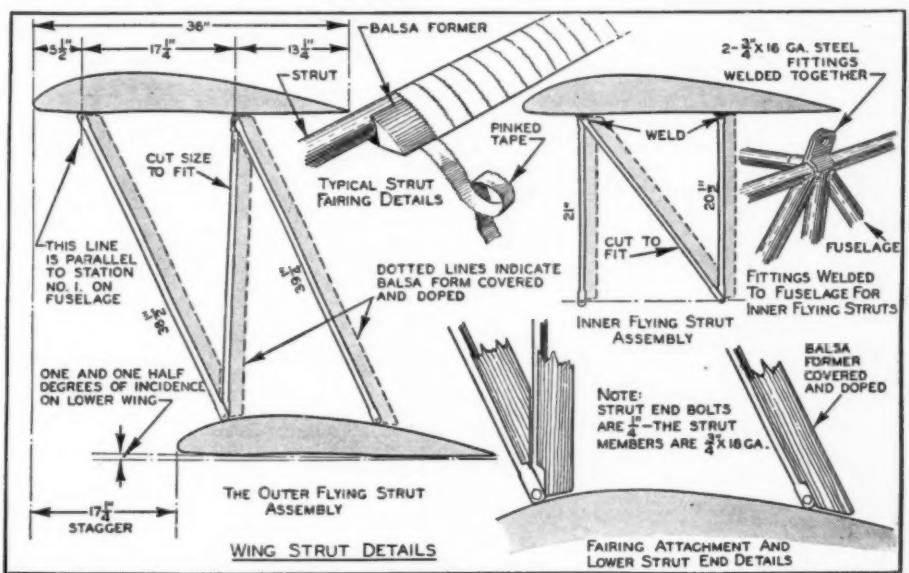
account for another four full ribs and five shorter ribs which extend to the rear spar only. In addition to these four more full ribs will be needed to complete the center section, making a total of 30 full ribs and 10 short ribs to be made before the wings and center section can be assembled.

The ribs are made from 1/8"x1/2" spruce with gusset plates of 1/32" fibre. This latter material is obtainable from most electric supply houses and is recommended in preference to plywood, which, though permissible, is more difficult to handle.

After laying out the rib jig from the drawings, steam the cap strips until they are pliable enough to be bent; then place them in the jig. Next cut the truss strips to size and set in place, brush plenty of waterproof glue into each joint and nail the gussets on, taking care to use plenty of glue on each gusset before setting it in place.

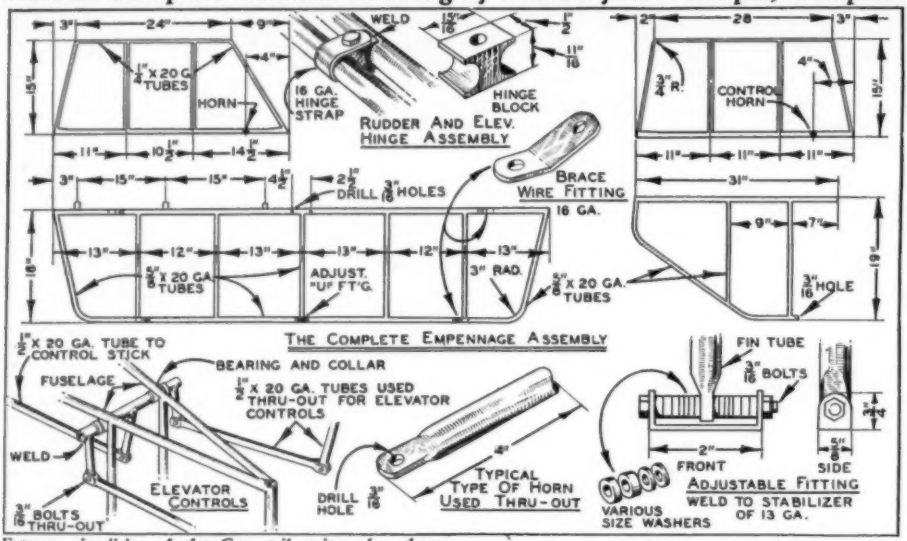
Twelve compression ribs—three to each wing—are specified in the plans. These are illustrated in detail on the wing drawing. They are made by stiffening the ordinary ribs at the points specified. It would be a good plan to make all four ribs for the center section in this manner. The slight increase of weight is nothing in comparison to the extra stiffness which will result from this treatment.

When all the ribs have been completed


36"
BALSA FORMER
STRUT
2-3/4"x16 GA. STEEL FITTINGS WELDED TOGETHER
PINKED TAPE
WELD
CUT SIZE TO FIT
TYPICAL STRUT FAIRING DETAILS
THIS LINE IS PARALLEL TO STATION NO. 1. ON FUSELAGE
DOTTED LINES INDICATE BALSA FORM COVERED AND DOPED
CUT TO FIT
FUSELAGE
FITTINGS WELDED TO FUSELAGE FOR INNER FLYING STRUTS
INNER FLYING STRUT ASSEMBLY
ONE AND ONE HALF DEGREES OF INCIDENCE ON LOWER WING
BALSA FORMER COVERED AND DOPED
NOTE: STRUT END BOLTS ARE 1/4" — THE STRUT MEMBERS ARE 3/4"x16 GA.
THE OUTER FLYING STRUT ASSEMBLY
STAGGER
WING STRUT DETAILS
FAIRING ATTACHMENT AND LOWER STRUT END DETAILS

The moving end joints for the center section, or cabane struts, suggested in Part I, are described in some detail here.

Here Is Complete Detailed Drawing of Tail Surface—Simple, Complete

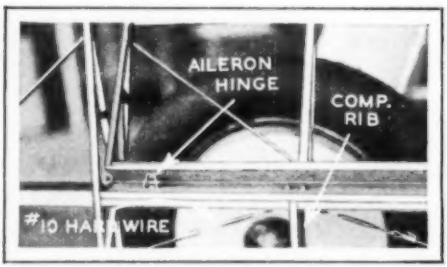


Extreme simplicity of the Gere tail unit makes these plans self-explanatory. The photo at right shows the tail group with elevators and horizontal rudder removed.

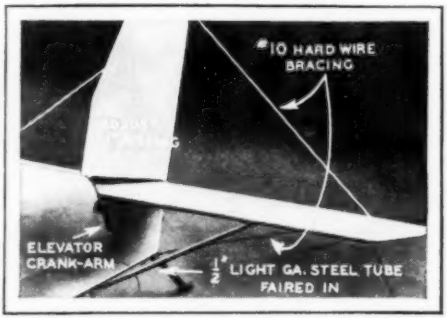
and the spars shaped to accommodate them the wings are almost ready to assemble. First, however, the spars have to be drilled for drag fittings, interplane strut fittings, etc., and the fittings themselves made. Follow the plans for these units. Drill the rear spar of each lower wing to accommodate the aileron hinge bolts and cut the fuselage end of all the lower spars to an angle of 10 degrees. This angle is necessary in order to secure a snug fit in the wing fittings attached to the fuselage on account of the dihedral angle of the lower wing.

The wings may now be assembled. Slip the ribs in place, following the plans for position, and secure in place. Bolt the drag fittings in place and rig the wing with No. 10 aircraft wire, using 325 SF turnbuckles to tighten. Great care should be taken in rigging the wings to ensure that they are finished absolutely true.

False ribs extending from the top of the front spar to the leading edge of the wing



Closeup view of the aileron. The inboard aileron hinge and a compression rib are seen to advantage in this picture.



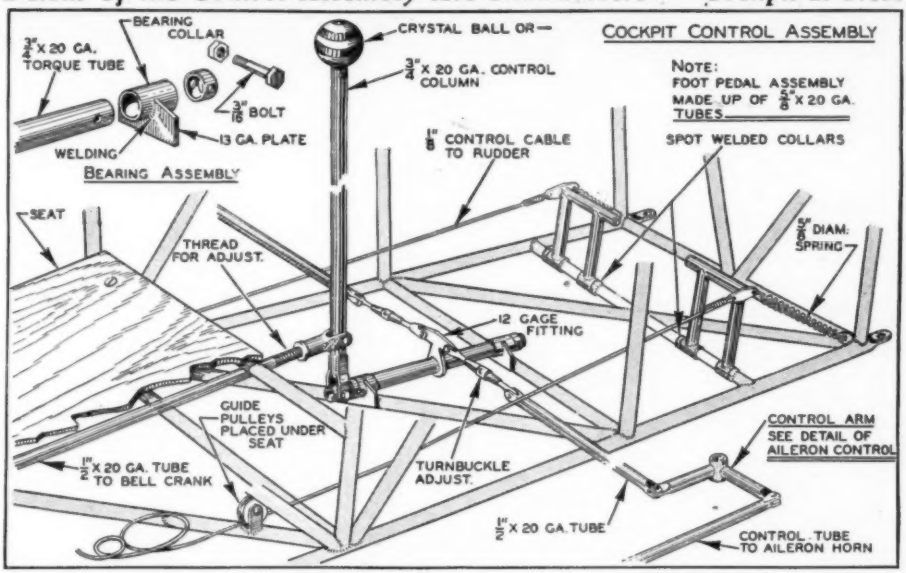
and situated between the main ribs are advisable. They are not shown in the drawings but can quickly and easily be made by taking lengths of 20 gauge hard wire and shaping it to the contour of the nose ribs. The ends of these wire nose ribs are pressed firmly into holes drilled in the front spar and the leading edge. If a more powerful motor is considered it will be advisable to cover the entire leading edge of the wings from the front wing spar to the leading edge member with 1/32" plywood. This in addition to the false ribs already mentioned.

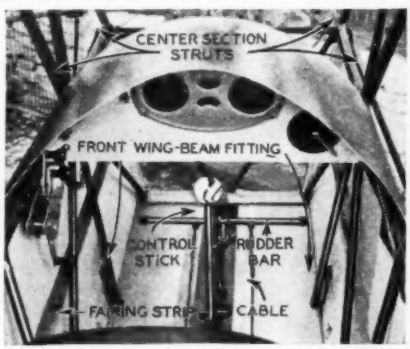
The Center Section

The center section is the next point of attention. Spars and ribs for this are exactly similar to the main wing construction, with the added suggestion that all four ribs be stiffened in the manner prescribed for the compression ribs. The spars should be drilled to take care of the upper wing fittings before assembling.

On the original ship no provision is made to carry either surge (water) or gas tanks

Details of the Control Assembly Are Shown Here — Cockpit Is Neat


COCKPIT CONTROL ASSEMBLY
BEARING COLLAR
¾" X 20 GA. TORQUE TUBE
⅜" BOLT
WELDING
13 GA. PLATE
BEARING ASSEMBLY
CRYSTAL BALL OR—
¾" X 20 GA. CONTROL COLUMN
NOTE: FOOT PEDAL ASSEMBLY MADE UP OF ⅞" X 20 GA. TUBES.
SPOT WELDED COLLARS
⅛" CONTROL CABLE TO RUDDER
SEAT
THREAD FOR ADJUST.
¾" DIAM. SPRING
12 GAGE FITTING
GUIDE PULLEYS PLACED UNDER SEAT
½" X 20 GA. TUBE TO BELL CRANK
TURNBUCKLE ADJUST.
CONTROL ARM SEE DETAIL OF AILERON CONTROL
½" X 20 GA. TUBE
CONTROL TUBE TO AILERON HORN



Note that the vertical rudder is the only cable operated control. A closeup view of the partly finished cockpit, with instruments on panel, is shown in photo at the left.

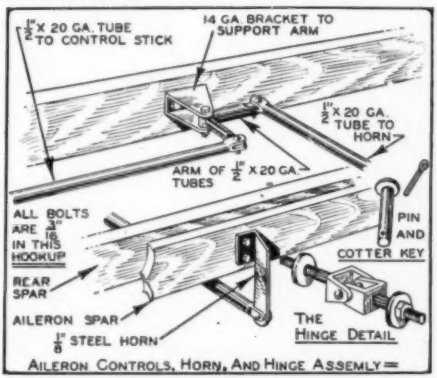
in this member. It was decided later to incorporate one or *both* of these tanks into the center section *and our recommendation is that actually both tanks should be located here.* It will simplify things generally and in consequence of this decision a layout showing this form of installment has been added since the first plans were made—this layout will be found on the continuation pages.

It shows the disposition of the two tanks and you will see that this arrangement makes a slight change in the rigging essential. The tanks occupy the spaces between the ribs left and right, the center space being rigged with No. 10 aircraft wire same as the wings. So before drilling the center section spars it will be necessary to check with the additional layout referred to.

The center section strut attachment system is shown in the drawings.

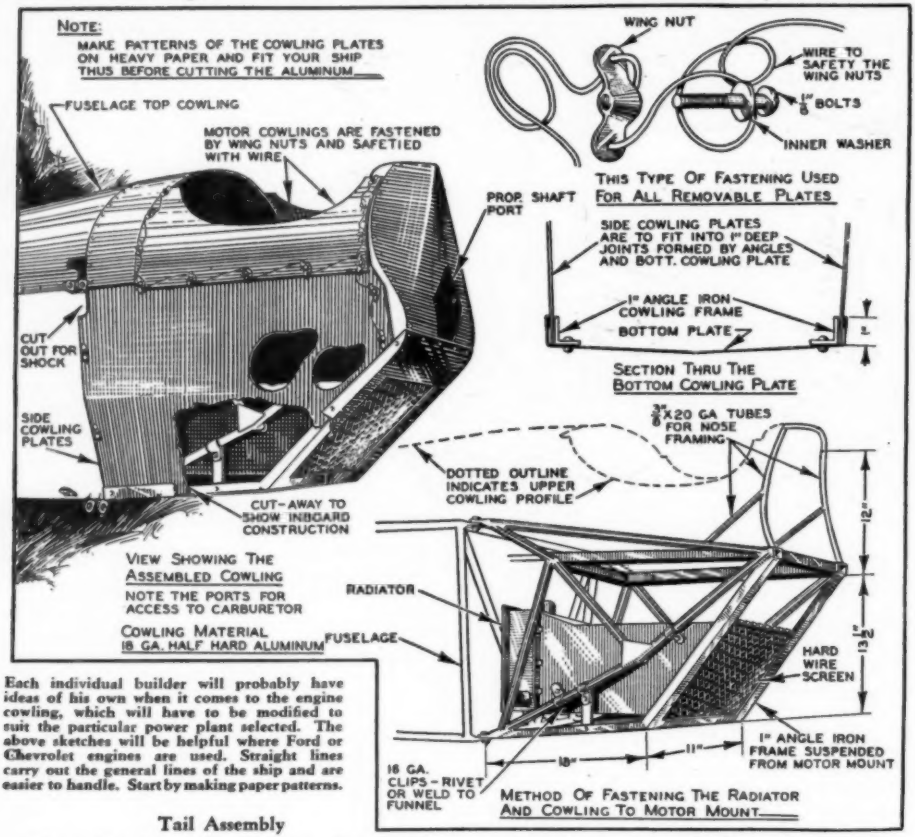
Ailerons

Ailerons are employed on the lower wings only. They are built up in the same manner as the wings and are attached by three hinges which are shown in detail on the drawings. The aileron control is operated by torque rod and bell and crank. This control, also shown in detail, should be made and fitted before attempting to cover the ailerons and wings. The entire framework of ailerons and wings should be given a good husky coat of varnish before covering, and if you have any misgivings about the covering operation itself drag out the old 1932 Flying Manual again—it tells all about it there!


½" X 20 GA. TUBE TO CONTROL STICK
14 GA. BRACKET TO SUPPORT ARM
½" X 20 GA. TUBE TO HORN
ARM OF ½" X 20 GA. TUBES
ALL BOLTS ARE ⅜" IN THIS HOOKUP
PIN AND COTTER KEY
REAR SPAR
AILERON SPAR
⅛" STEEL HORN
THE HINGE DETAIL
AILERON CONTROLS, HORN, AND HINGE ASSEMBLY

This detail drawing explains the aileron hinge construction and gives further information on the aileron controls.

Motor Cowling, Fitted to Individual Motor, Requires Ingenuity, Patience


NOTE:
MAKE PATTERNS OF THE COWLING PLATES ON HEAVY PAPER AND FIT YOUR SHIP THUS BEFORE CUTTING THE ALUMINUM
FUSELAGE TOP COWLING
MOTOR COWLINGS ARE FASTENED BY WING NUTS AND SAFETIED WITH WIRE
PROP. SHAFT PORT
CUT OUT FOR SHOCK
SIDE COWLING PLATES
CUT-AWAY TO SHOW INBOARD CONSTRUCTION
VIEW SHOWING THE ASSEMBLED COWLING
NOTE THE PORTS FOR ACCESS TO CARBURETOR
COWLING MATERIAL 18 GA. HALF HARD ALUMINUM
WING NUT
WIRE TO SAFETY THE WING NUTS
1/8" BOLTS
INNER WASHER
THIS TYPE OF FASTENING USED FOR ALL REMOVABLE PLATES
SIDE COWLING PLATES ARE TO FIT INTO 1" DEEP JOINTS FORMED BY ANGLES AND BOTT. COWLING PLATE
1" ANGLE IRON COWLING FRAME
BOTTOM PLATE
2"
SECTION THRU THE BOTTOM COWLING PLATE
3/8" X 20 GA TUBES FOR NOSE FRAMING
DOTTED OUTLINE INDICATES UPPER COWLING PROFILE
RADIATOR
FUSELAGE
12"
13 1/2"
HARD WIRE SCREEN
1" ANGLE IRON FRAME SUSPENDED FROM MOTOR MOUNT
18"
11"
18 GA. CLIPS - RIVET OR WELD TO FUNNEL
METHOD OF FASTENING THE RADIATOR AND COWLING TO MOTOR MOUNT

Each individual builder will probably have ideas of his own when it comes to the engine cowling, which will have to be modified to suit the particular power plant selected. The above sketches will be helpful where Ford or Chevrolet engines are used. Straight lines carry out the general lines of the ship and are easier to handle. Start by making paper patterns.

Tail Assembly

The entire tail assembly is so thoroughly explained in the detailed drawings that little comment is necessary. As it is a welded job from start to finish the same care should be lavished on this unit as has been already given to the fuselage. Make the necessary hinges for flippers and vertical rudder and all other fittings shown in the detail. After the assembly is completed check for fit on the fuselage, as it may be necessary to make a few alterations and this is more easily attended to while the framework is still uncovered.

The Controls

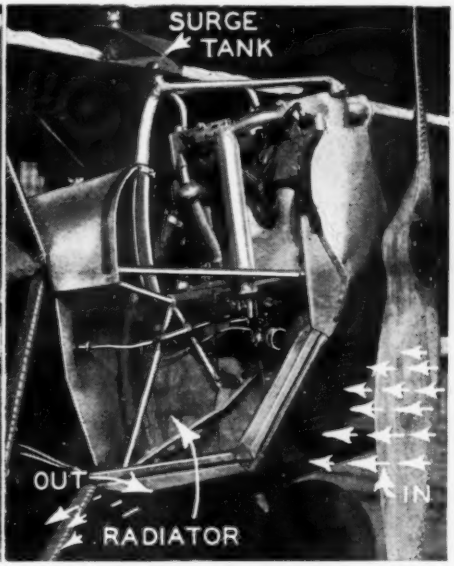
These have been covered in great detail in the working drawings. One of the outstanding features of the Gere plane as Bud built it is the excellent operation of all the controls. As will be seen from the drawings, positive control is used in all cases with the exception of the rudder control, which is operated by cables. The location of the control column and the rudder bar is not arbitrary—these units may be placed in what seems to be the most comfortable position for the pilot. This being the case, control rod lengths and similar measurements will have to be determined by the builder to suit his needs.

Instruments

The only essential instruments are the oil gauge, tachometer, altimeter, air speed

SHOP BLUEPRINTS FOR THE GERE SPORT BIPLANE

Complete working blueprints made from the original drawings appearing in this series of articles are available for $5 per set from the Blueprint Department, Modern Mechanix and Inventions, 529 South Seventh Street, Minneapolis, Minn. These prints are about four times the size of the reproductions appearing on these printed pages of the magazine, greatly simplifying the building process. They come in a long roll which can be cut apart for workshop convenience, and are genuine blueprints which will resist wear and tear. They do not show motor conversions. Separate blueprints for airplane conversion of a Ford Model A motor are available for $1.00; of the Ford Model T motor, 50 cents.



The unusual radiator mounting shown here is used with Ford type motors as well as with the Chevrolet seen in these pictures. If an air-cooled motor such as the Packmag Twin is installed, the radiator is, of course, eliminated.

indicator and switch. For those who have the means the combination instrument panel as used by Gere will add a finishing touch to this smart little ship, but it can of course be dispensed with.

Wing struts are covered in detail drawings. The diagonal strut should be cut to the proper length before welding and a jig should be used in assembling both the outer bay struts and the center section struts. The center section struts are welded to the spar fitting at the top, but we recommend a moving joint at the fuselage point of attachment. This is not *necessary* and if the builder prefers he may dispense with fuselage fittings and moving strut ends at this point, merely welding the lower ends of the struts direct to the fuselage. Flying wires and wing bracing generally may be either ¼" streamline cable or stranded cable. Although some may feel like using ordinary aircraft wire for rigging the wings, it is not desirable and should be avoided. Rig the ship with great care, as the wings must be true in every respect.

Covering

Use a good grade of airplane fabric throughout and give six coats of dope, using pigmented dope for the last three coats. Added attractiveness is obtained by finishing the ship in one of the many striking color combinations which Berry Brothers, Detroit, furnish on request for a nominal sum—if indeed they make any charge at all.

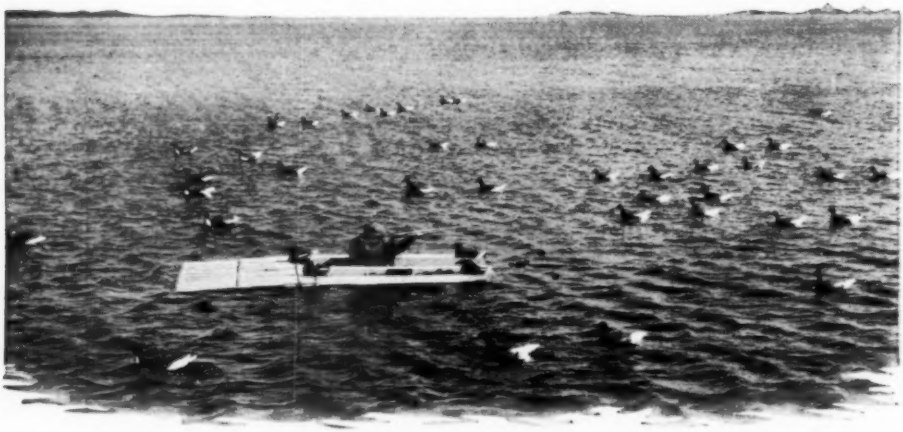
Miscellaneous Details

The motor cowling will naturally depend on the type of motor selected. However, if a Ford

(Continued on page 154)

The late Bud Gere surveying his handiwork. This photo emphasizes the all-around sturdy construction of the ship.

Low-Floating Sink-box



Here's the sink-box in action. A battery of decoys will lure the birds down within firing distance so you can blaze away while the blazing is good. Since the box floats almost flat on the water, it offers no menace to arouse suspicions of ducks.

ACTION and new thrills await the fall hunter who shoots ducks and geese from the new type sink-box, which, set out on the water and surrounded by a battery of innocent appearing decoys, is sure to attract the daily quota of fowl easier and quicker than any other method.

The sink-box is a rectangular, flat-bottomed boat, equipped with wooden wings fore and aft, and at either side, as shown in the diagrams and photos. These wings lie back on the water when the box is in use and is utilized as a blind in which the hunter lies, face upward, motionless and out of sight, until the flying birds have begun to decoy. Then he rises quickly to a sitting position, takes careful aim, brings down as many of the waterfowl as possible, gathers in the game and settles back to await another flock.

Laying Out Your Decoys

About one hundred anchored decoys are laid out surrounding the sink-box, four or five of which rest on the wings, making this appear as an island about which the resting waterfowl are enjoying a feed. The outfit is placed three-quarters of an hour before dawn, so that early flying fowl will not be suspicious of the set.

The hunter, ensconced in the box, faces the prospect of a ducking, should the wind start blowing, since the box is sunk to the water's edge by use of iron weights that no part may appear above water, and this weight and the body of the hunter, plus a little wind, will cause the box to ship enough water to swamp it.

However, usually this method of waterfowl hunting is used in water only two or three feet deep, so the worst that befalls the hunter is a ducking while he perches precariously on the sides of the box and waits to be rescued.

Within the box he has a rubber sheet on which he lies, and a sponge which is useful in bailing out the few drops of water that may be washed inboard or may be brought in by the hunter when he returns to the box after retrieving his birds.

Craft Is Stable in Rough Water

The sink-box is 6 ft. long, 30 in. wide, by 24 in. deep and is equipped with a seat across the fore end, which is set at a depth of 6 in. It comes in extremely handy in loading the firearm or retrieving waterfowl. The bottom is flat, top edges on a straight edge, sides straight, ends with only a slight slope, which, with the brackets used to support the wings, materially assist in making the craft more stable in rough water.

The sides are built of matched cypress, the bottom of matched fir, the gunwales and seat of pine. Any person handy with a saw and rule can easily build a sink-box, by using a few simple marine rules to insure a water-tight job. Coat all tongue and grooved edges with white lead, fit as tightly as possible, and coat all nails with cement, to keep them from rusting. Bevel the end boards to insure a close-fitting connection.

When the box is finished use a 1x12 in. fir board, coated with white lead on the under side, as a keelson to protect the bottom boards and to help withstand the weight of the hunter.

The wings are made of matched cypress, cut 84 inches long, to form a wing 36 inches wide. Two of these, hinged, are attached to the afterend of the sink-box. The side wings are made of two cypress boards,

is Invisible Duck Blind

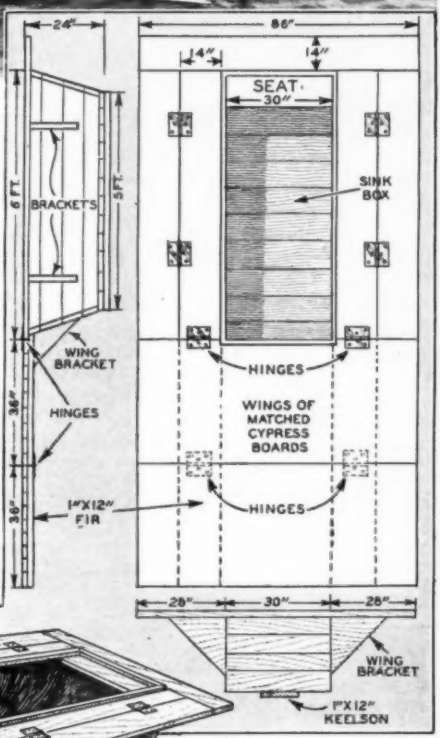
Close-up view of the sink-box shows how it floats with almost no freeboard. Victimized ducks can be laid out on the wings till fellow hunter comes along to take you in tow.

14 in. wide, hinged to fold, while the end board is cypress, 84 in. long by 14 in. wide, hinged to the fore end. Coat all lumber with white lead, and paint a dull grey, to further the idea that a large rock projects from the water, on which waterfowl are resting.

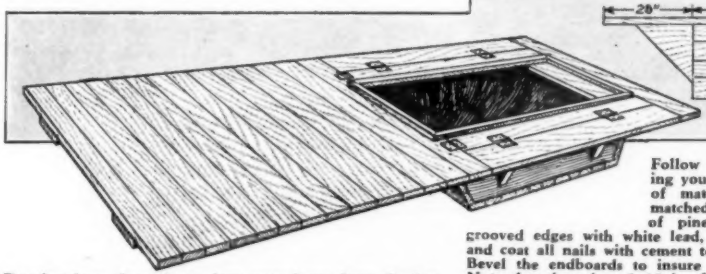
Sink-box Won't Frighten Ducks

Success in bagging waterfowl depends on use of the right kind of blind. The sink-box permits the hunter to get right out where the shooting is best, to a spot which is not the least suspicious-appearing to the fowl, because it is different from inland blinds. Next in importance is a good double-barreled shotgun, which insures the hunter more than one try at a flock.

Light-feathered early-season fowl may be brought down with No. 6 shot, but later, when we go after heavy-feathered birds, No. 4 and 5 shot is better, since it insures the spread and penetration necessary to drop the speedier, heavier birds.



Follow these dimensions in building your sink-box. Sides are built of matched cypress, bottom of matched fir, and gunwales and seat of pine. Coat all tongue and grooved edges with white lead, fit as tightly as possible, and coat all nails with cement to keep them from rusting. Bevel the endboards to insure a close-fitting connection. Note that there is a 1x12 in. fir board coated with white lead on the under side to serve as a keelson. This helps withstand weight of hunter. Keelson ordinarily rests on bottom of lake.



Drawing here shows how wings extend out from the box in which hunter sits while awaiting his prey. Hinges on under side of wings permits it to be folded when out of use. Rubber mat should be laid on bottom.

Build these Olympic Devices

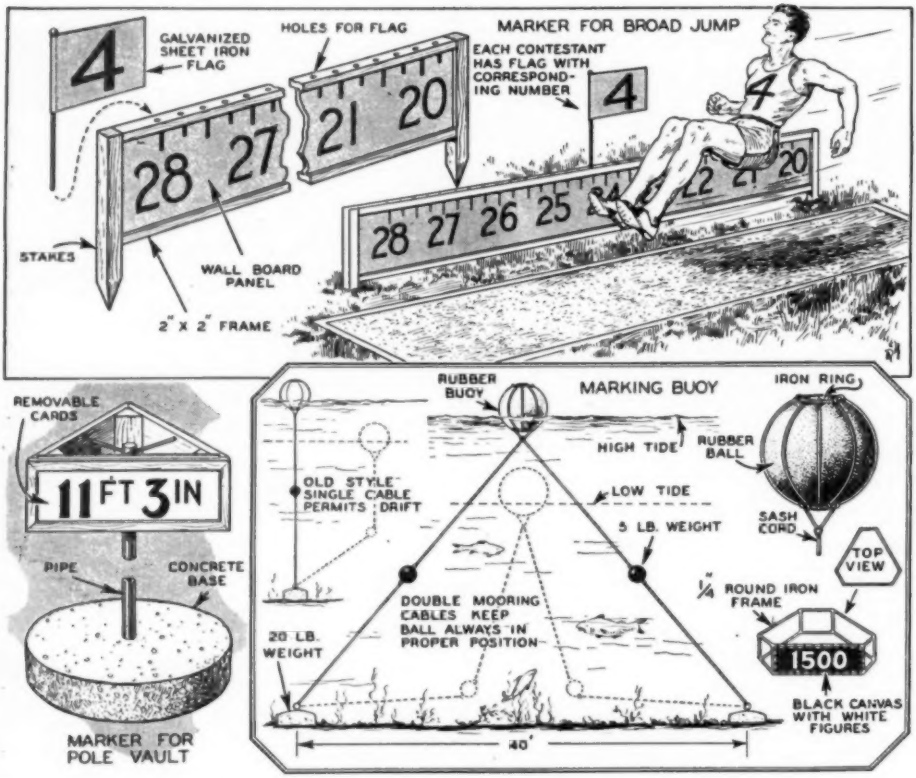


Fig. 1. At top you see the marker for broad jump, which informs the spectators in grandstand the distance of the leap of each contestant. For pole vault use marker in lower left drawing. There will be no deviation in the water race-course distance if marking buoys are anchored with twin cables and weights illustrated in the lower right drawing.

A NUMBER of new devices have been developed to facilitate running off athletic events in the Olympic Games, Los Angeles, and are in most part so simple they can readily be adapted for other contests.

A novel method of mooring a marking buoy on a rowing course is shown in Fig. 1. Rubber balls are anchored with two weights set about 40 feet apart on the bottom, and midway up the mooring cables are smaller weights. As the tide lowers the surface of the rowing course, the smaller weights draw in toward each other and cause the buoy or ball to descend vertically, thus always keeping its relative position on the course.

In the old method of anchoring with only one cable, the buoy can drift to one side of its location when the tide goes out. As there is a variation of 7 feet on the Olympic course, the new method of mooring the balls is indispensable.

On the 2000-meter course 12-in. balls are moored every 100 meters, with 24-in. balls at intervals of 500 meters. In each case the balls are held in a sort of rope cage, as illustrated, and the larger balls are equipped with an iron frame having three panels carrying a rectangle of canvas with the distance marked thereon. The frame is welded in a triangular shape from ¼ in. round iron.

Announcing Board for Broad Jump

The broad jump and similar events are made much more interesting to spectators by having a large graduated announcing board alongside the pit, carrying numerals from 20 to 28 ft., inclusive. See Fig. 1. Each contestant is allotted a sheet-metal flag with his corresponding number. Thus when contestant No. 4 makes a jump of 25 ft. 9 in., the flag staff is set in a hole on the frame at that point. The figures being about 12 in. high and white on a black background,

for Home ATHLETIC Events

the spectators are instantly informed of the marks of the contestants.

A duplicate of this board is easily made of a wallboard panel set in a wood frame of 2 in. by 2 in. material, with stakes at each end. For the pole-vault, a triangular frame is made for removable cards. It is mounted on a pipe standard with a concrete base, and is set at one side of the uprights.

Targets Show Shot Fired Too Late

In the rifle and pistol events the old style disappearing target which rose from the pit and dropped was not entirely satisfactory, because the contestant could frequently hit it while dropping. The new type illustrated in Fig. 2 is mounted on a vertical axis and by means of cables is turned quickly with the edge toward the marksman. Thus if he hits it while turning the fact will be apparent by the diagonal perforation in the target. In the dropping target no one could determine whether the shot registered after the target started to move, or merely was a high bullet on a stationary target.

The target panels are mounted in groups as required and all operated by one pair of cables. The lower axis with operating arm is made of pipe and fittings, as shown in the detailed drawing. Note that the arms are mounted at a 45-degree angle to insure prompt action.

A double-deck shelter (Fig. 2, at bottom) has been designed for the shooting contestants, arranged for standing entrants on the first floor and those firing from a prone position on the upper deck. By virtue of the grade upon which the pits are located, targets are at the level of the eyes of all contestants.

You Can Duplicate Olympic Devices

The upper deck is shaded with an awning supported by a pipe frame, and the marksman lies flat on a four-inch sandy loam bed to simulate natural outdoor conditions. The lower deck is rough slab with monolithic finish. The targets are operated from conventional concrete pits, as shown.

All of the foregoing projects are of comparatively simple construction, and will make any field meet more interesting to spectators who perforce must witness the events at some distance from the field.—Hi Sibley.

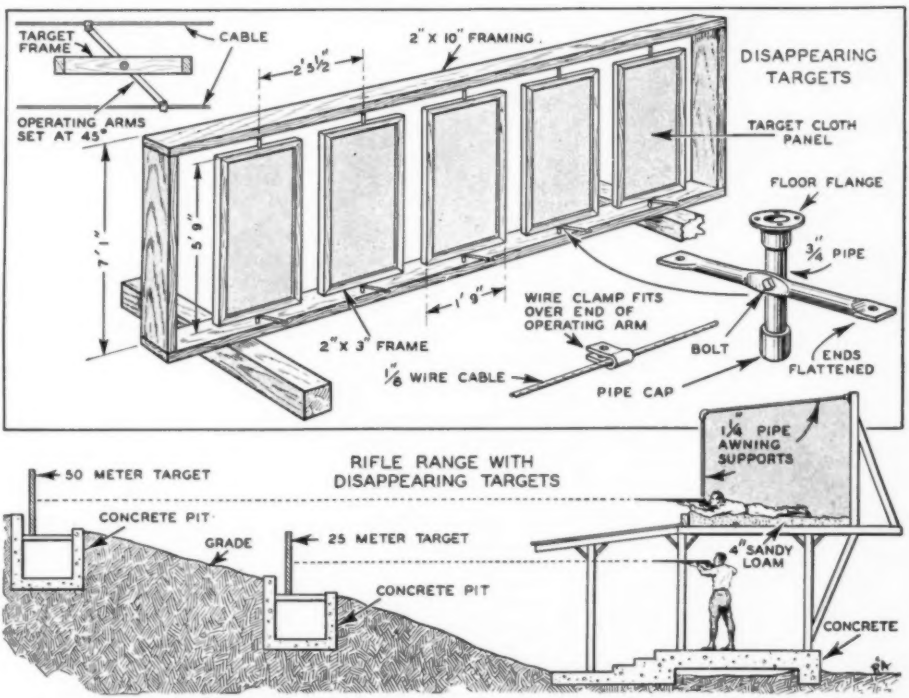
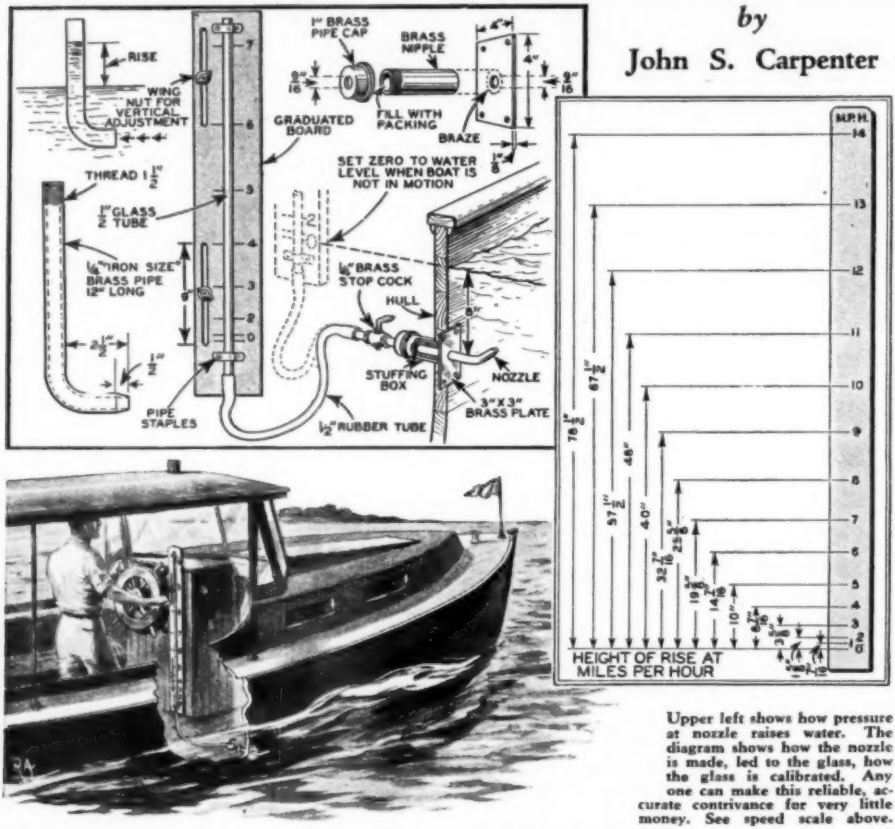


Fig. 2. Introduced at Los Angeles Olympics, the disappearing target seen in the top drawing tells if shot was fired after proper moment by diagonal perforation in the panels. All the targets, working on pivots, disappear simultaneously. Double deck shelter, from which contestants could fire at targets at eye level, won wide favor among marksmen.

A GLASS Tube Boat SPEEDOMETER

by

John S. Carpenter



Upper left shows how pressure at nozzle raises water. The diagram shows how the nozzle is made, led to the glass, how the glass is calibrated. Any one can make this reliable, accurate contrivance for very little money. See speed scale above.

HERE is an easily made and accurate speedometer for boats that anybody can make, or have made, at very small cost. Mine cost $2. The principle of operation is hydraulic pressure against one end of a bent tube. Having no springs or other moving parts to get out of adjustment, it is one of the most accurate speed measuring devices of the hydraulic engineer. Figure at upper left shows the principle; a bent glass tube is held stationary in a current of flowing water, the effect of which is to cause water to rise in the vertical leg of the bent tube, by the hydraulic pressure on the nozzle of the tube. The height that the water will rise depends on how fast the current is flowing against the nozzle end and the rise can be very accurately calculated.

In the case of a boat, the bent tube is of brass and projects through a simple stuffing box set into the hull. See drawing. A flexible rubber hose carries the pressure to a vertical glass tube. The glass tube is mounted on a board, which should be painted white and graduated with black lines so the speed in miles per hour is indicated by the top of the vertical water column. The impact end of the bent tube should be not less than three inches away from the surface of the hull and also, if possible, not less than eight inches below the water line, without passengers. The graduated board should be mounted so that it can be raised or lowered to bring the zero miles mark level with the water level in the glass tube when the boat is not in motion. The amount that the gauge board may have to be raised will depend on how much deeper the boat sinks when loaded to its maximum.

To make the bent brass tube, see outside of hull, get a piece of ¼" inch "iron size" brass pipe (your plumber carries it) 12 inches long, threaded one end and make a right-angled bend with a 2½ inch leg as shown. Bevel back ½ inch from the short end by filing and have the impact end of tube down to a sharp edge so it will cut the water without disturbance.

SPARKS from the RADIO EDITOR

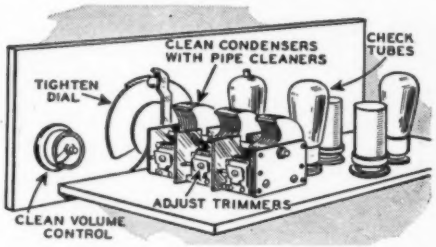
Edited by L. B. ROBBINS

Overhaul Your Radio for Better Volume

WITH autumn, the radio season, approaching, it behooves broadcast fans to give their sets an overhauling. After the tubes have been tested, probably the most logical place to begin is the antenna system. Examine all wires carefully, and see that the ground connection to the water pipe has a firm contact.

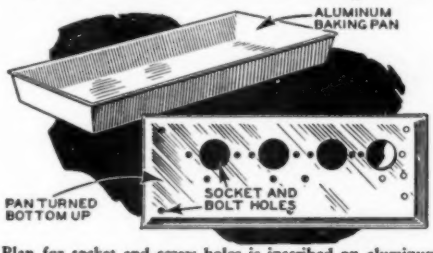
Next in importance are the tuning condensers. Crackling, which is most frequently caused by dust between the plates, can be remedied by a thorough sweeping with a pipe cleaner. If you're having tuning troubles, look to your trimmers. Tune in a station with moderate volume and turn the adjusting nut on the first trimmer until the signal is loudest. Leaving the condensers stationary, adjust the next trimmer, and so on until the set is "balanced."

Dirty volume control is sometimes responsible for the awful noise that issues from the speaker. Here, remove the entire resistance unit and wipe the dirt thoroughly from the strip and the sliding contact. Be sure that the contact is tight when replaced. Finally tighten the dial.



Radios, like autos and people, need periodic overhauling. If crackling issues from speaker, clean condensers and volume control. Better have tubes checked by radio dealer.

Radio Chassis From Baking Pan



Plan for socket and screw holes is inscribed on aluminum baking pan "chassis" with carbon paper. Drill out small holes, and cut out socket openings with jeweler's saw.

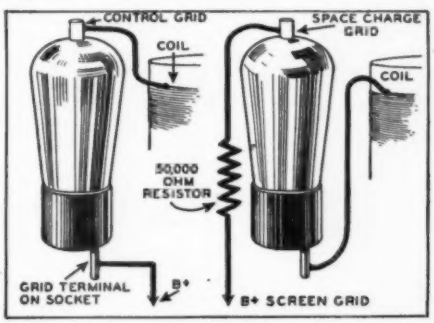
FOR the builder who desires a metal baseboard or "chassis" for his receiver, an ordinary aluminum baking pan will fill the bill ideally. First lay out your assembly of parts on a sheet of paper the size of the pan, scribing all holes exact size with a compass. Next turn the pan bottom side up, then lay a piece of carbon paper on the metal. Now lay the drawing over that and draw over the lines with a hard pencil. When the carbon paper is lifted the tracing will be found on the aluminum. Finally drill out the small holes and cut the larger ones with a jeweler's saw. File the edges off smooth.

Increasing S. G. Tube Sensitivity

THE majority of radio sets with screen-grid detectors may be made much more sensitive by taking off the grid lead to the top of the tube and also unsoldering the "B" supply lead to the screen grid, which is connected to the regular grid terminal on the five prong socket.

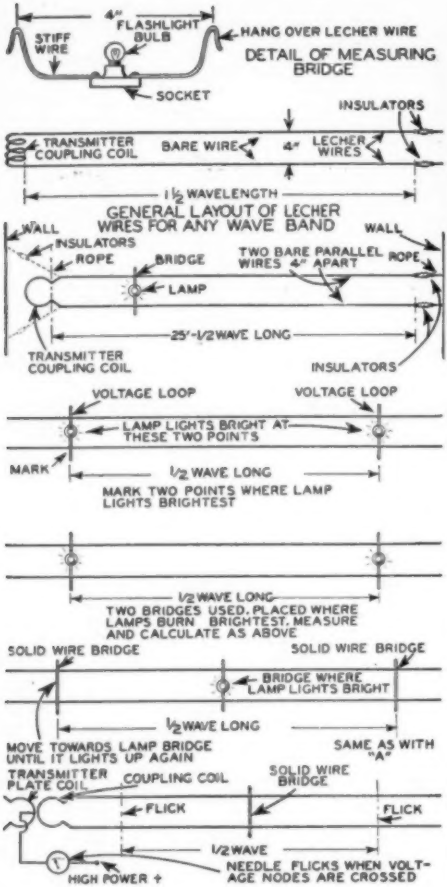
Now connect the coil lead to the regular grid contact on the socket, and then solder a fifty to 50,000 ohm fixed resistor, in the space charge lead. The other end of the resistor is then connected to the top of the tube, so that you will then have a space-charge detector instead of the regular screen-grid.

It has been claimed that the space-charge method is about eight times as sensitive, although the selectivity of that particular stage is lowered. The resistor is to keep the voltage low enough on the space-charge grid.



Switching B plus and control grid connections and inseting resistor in circuit, boosts screen grid tube sensitivity.

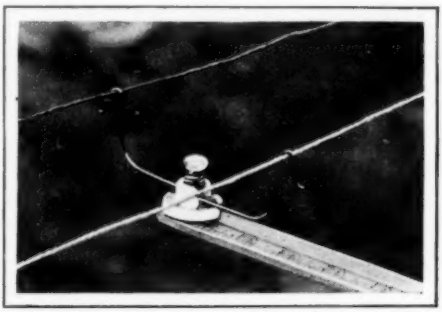
Measuring Wavelength of the M-M 5-meter Transmitter



Lecher wires for the 5-meter transmitter are strung up as illustrated at top. Tests for wavelength should be conducted by moving bridge along wires as in lower drawings.

WHEN one gets to the point of working a transmitter on the higher frequencies, the measuring of wavelength (or frequency) becomes possible. With the proper equipment, along with a yardstick, the actual length of the waves can be actually seen and measured. The trick is very simple.

Place the oscillator in a fixed position with plenty of room in the clear. Then connect a pair of strong, bare wires to the ends of the antenna coupling coil. If the coupling coil cannot stand the strain, then the latter must be anchored to a wall by insulators and cord. We will assume for illustration that you have the M-M five-meter transmitter and wish to tune it to the center of the 5-meter band or approximately 58,000 kilocycles. By its construction you



Here is the bridge employed in the test. A yardstick may be utilized to move the lamp along Lecher wires in searching for the point at which the lamp glows the brightest.

are positive the tuning condenser will cross the five-meter band at some point on the dial. Set the transmitter up in a rigid position and connect two bare wires, which should be 25 feet long, to the coupling coil.

Now stretch them out taut and about 4 inches apart and fasten the outer ends, with insulators and rope, to an opposite wall or support. These two wires are called Lecher wires.

Start the transmitter oscillating. This may be determined by drawing a small spark from a lead pencil touching the plate coil, or by a dip in the milliammeter.

Four Methods to Test Wavelength

Wavelength can be determined in four ways shown in the four lower sketches at the left. In the first test you will need a "bridge." This consists of two short, stiff wires connected to a miniature electric lamp socket into which is inserted a flashlight bulb, as illustrated in the photo.

Now, commencing at the coupling coil end, slide the bridge slowly along the Lecher wires until the bulb suddenly lights up. Loose coupling of the transmitter coils will give the best results.

Use a stick to push the bridge along the wire. Push back and forth until the point of brightest illumination is found and mark that point. Now push the bridge along again for about 8 ft. There again the light ought to glow brightly. It will be dead between these two points.

Locating the Half-Wave Point

Find the brightest point on the wires again and mark that. Measure the distance between the two marks and you will have found half a wavelength. For 56,000 KC the full wave should measure approximately 16 ft. 6 in. so the half wave measurement for that frequency, the distance between points will be about 8 ft. 3 inches.

For the other end of the five meter band, 60,000 KC, the full wave measurement will be about 15 ft. 7 inches and the half wave measurement of the Lecher wires should be about 7 ft. 9½ inches between points.

(Continued on opposite page)

Chart Shows How to Make Connections to Tube Sockets

ONE of the most bothersome phases of assembling a radio in these times is for the builder to know just how to make connections from the two types of sockets in common use (UX and UY) with the many types of tubes in use.

Therefore the accompanying chart has been prepared showing the several types of tubes that can be used with these two kinds of sockets and just how the wiring should be run.

The UX type socket adapts itself to the greatest number of tube types as shown. With any of them the wiring is done just as illustrated in the top group at the right —Plate to P, Grid to G, and the two filament wires to F and F.

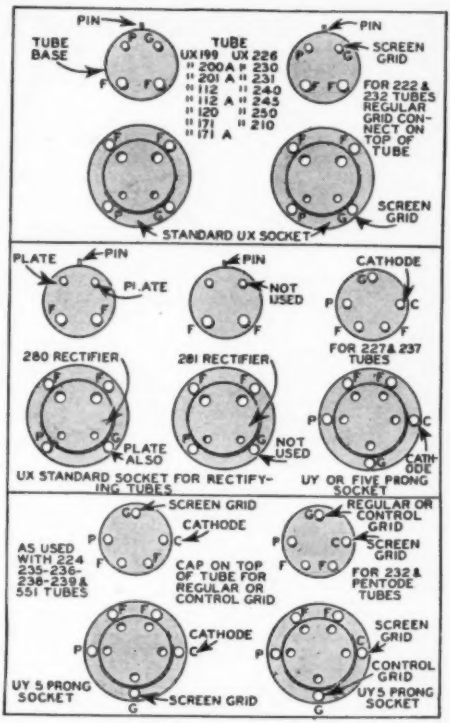
The same group also shows how the two filament-type screen-grid tubes—222 and 232—are connected. With either one of these the screen-grid wire connects to the G post while the regular or "control grid" is attached to the post on the top of the tube by a cap or clip.

Again the UX socket is used for the two common rectifier tubes. For the 280 type that employs two plates, both the P and the G post on the socket connect to the two plate connecting wires as shown in the middle group. The 281 tube has only one plate and, of course, no grid. Consequently the G post is left unused in a rectifier hook-up.

Now in the lower group we come to the UY or five prong socket. This makes allowance for the cathode which really takes the place of the filament in other tubes. In cathode tubes it is the cathode that emits the electrons and is merely heated by the filament inside it. For use with the 227 and 237 tubes connect just as shown on the socket—C, or sometimes K, being the cathode connection.

For screen grid AC heated tubes connect as in this drawing. Here the G post is used for the screen grid connection while the control grid connects to the post on top of the tubes as in the case of the 222 and 232.

The pentode tubes—233 and 247, use a filament but make use of the five prong socket because of the extra grid. With them the control grid connects to the usual G post but the screen grid connects to the C post as shown. The third grid of the pentode has no external connection.



If you are in doubt about connections on any type of modern tube socket consult this chart. Cathode of UY socket may sometimes be marked with K instead of C.

Method of Testing 5-meter Transmitter Applicable to All Wave Lengths

(Continued from opposite page)

Thus by following a conversion table for frequencies into feet you can find the proper point for setting the transmitter between the limits of 56,000 and 60,000 kilocycles. This gives you 4,000 kilocycles into which you are allowed to operate the transmitter.

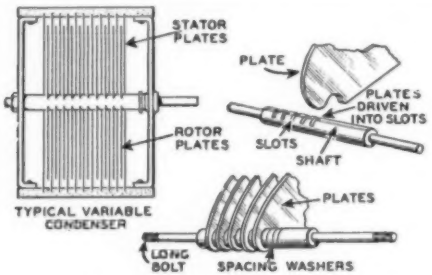
The three lower drawings show similar methods of measurements. Third drawing from bottom uses two bridges instead of one. Set each one at a voltage loop which will light up the lamps, find the points of greatest brilliancy, and measure the distance between them for the half wave length.

Next is another method. Here one bridge is located on a voltage loop for brilliancy. Then two bridges of solid wire are slid along the Lecher wires towards the lamp. When first placed on the wires the lamp will probably go out, but as they approach the node the lamp will light up. When these solid wire bridges are at both nodal points the lamp will remain lighted and the distance between the solid bridges will again be the half wave.

Bottom drawing shows how to measure without a lamp. Use one solid wire bridge and slide along until the milliammeter in the transmitter plate circuit flicks sharply. Then move the bridge along until the second flick occurs. The space between these points is the half wave length.

These methods can all be applied to any wave length so long as the Lecher wires are long enough to more than cover the wavelength desired.

Reducing Capacity of Variable Condenser for S. W. Work



In photo at top is seen condenser dismantled for removal of plates. Shaft is removed for taking off plates spaced with washers, while soldered plates must be pulled off.

NOW that short wave receivers and transmitters are so much in the radio public's mind, the builders of such apparatus are forced to buy parts, particularly condensers, adapted to such hook-ups. Considerable money can be saved, however, if the constructor will use any 23 plate variable condenser (or less) and remove enough of the rotor plates to reduce the capacity to that required.

For the type of condenser built up with spacing washers, the rotor must first be removed from the frame by taking off the necessary nuts and washers according to the make of condenser. There is no necessity for taking the stator apart, as only those plates that mesh together determine the capacity. The extra stator plates will have no appreciable effect on capacity.

While you have the rotor dismantled it will be a wise plan to wash the plates in gasoline, as well as the rotor shaft pivots or any bearing surfaces. Make sure the pigtail connection is intact.

Now put back as many rotor plates as are needed to build up the desired capacity. Put the spacing washers between them, and to make up for space lost by omitted plates put a shim or additional washers on the shaft.

Trimming Down Swedge-plate Condenser

When completely reassembled the rotor should look exactly as before, except there will be less plates. Clean out the spaces between the stator plates with a pipe cleaner and your condenser should work just as well as before.

Trimming down condensers with swedged plates or with ones soldered is not a difficult job. Remove the rotor as before and clamp the shaft in a vise, using lead to protect it from the jaws. With swedged plates it is only necessary to grab the plate with a pair of pliers and work the plate back and forth until the plate pulls out. If the plates are soldered in place you must then hold a soldering iron close to the slot and pull on the plate at the same time.

If a plate is accidentally bent it can be straightened by putting it between two pieces of hard wood and clamping it up tightly in a vise.

Calculating Condenser Capacity

Condenser capacity depends upon the size of the plates, the spacing distance, and the number of plates that mesh. If you have, for instance, a condenser of average size of 23 plates that is rated at .0005 or 500 mmfd. and you want one of .00025 or 250 mmfd. then you can assume that by removing half the number of rotor plates you will get half the capacity or about .00025. This same plan can be carried out in lowering the capacity of condensers of other sizes.

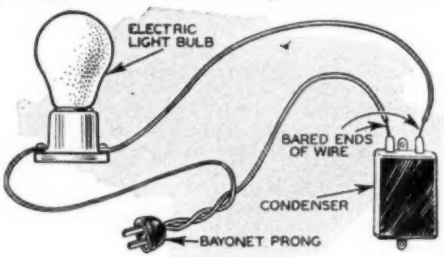
This of course is a rough method but good enough for all practical purposes in set building where an exact dial setting is not necessary.

Light Bulb Makes Indicator for Tracing Down Blown Paper Condensers

TRACING out a blown condenser is not always so easy, but with the simple testing unit shown in the accompanying sketch you will find it much easier than by the cut and try method. All you need is some insulated wire, a bayonet plug, an electric light bulb and a socket.

Connect them up in series as indicated. Bare the two wire ends and plug the bayonet into any convenient 110 volt A.C. receptacle. Then touch the two wire ends to the terminals of the condenser.

If the condenser is OK the bulb will light up at dull glow and continue burning so. If it is blown it will light up brilliantly, as it is passing the full voltage and current consumed by the lamp.



To test condenser touch bared ends of wire to terminals. Condenser is okay if bulb lights up at dull glow. Full brilliant light indicates that condenser has gone "haywire."

Things to Make with Tools

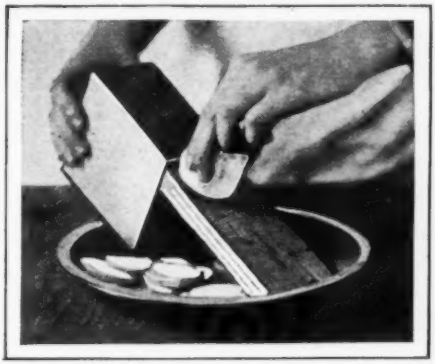
Edited by A. NEELY HALL

Tin Can Potato Slicer

IF YOU'RE in a throwing mood, here's something for you—a potato slicer that can be thrown together in a jiffy from a few parts that ought to be lying around loose in any workshop.

What is needed is simply a square tin can (the thicker the better) and a piece of board that will fit snugly inside the can. Set the board in place in the manner illustrated in the accompanying drawing. The end of the board should come within about two or three inches of the rear of the can.

With this much done, nail the board in place. Your potatoes are sliced by simply sliding them along the board as demonstrated, and the edge of the tin can will take care of the rest. You can set the slicer at any thickness you want.



Edge of can slices potatoes, which are slid along the board.

Old Inner Tube Makes Flexible Cover for Handy Little Shop Bellows

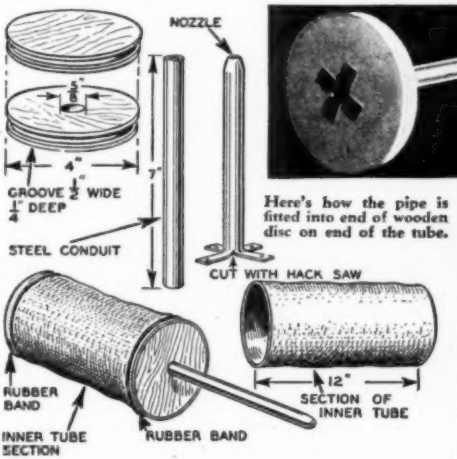
A FEW vigorous strokes with this large-capacity bellows and a cloud of fine shavings can be blasted from your lathe, band or bench saw. It cleans your workbench in short order.

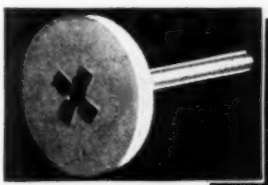
The few parts required are a short length of thick-walled inner tube, two wooden discs, and a short length of small diameter pipe, preferably ⅝ in. steel conduit.

One end of the pipe is split with a hack saw, and the four sections turned over at right angles, flattened and drilled for small nails. The other end is formed into a nozzle by heating it in a blow torch flame and pounding the end down into a conical shape, with a ⅛ in. opening.

On each end of the section of rubber hose is a wooden disc. These are turned down 4 inches in diameter, with grooved edges. A hole should be bored through the center of one disc, slightly smaller than the nozzle, which is then driven in to a tight fit. Small nails should be driven through the holes in the turned-over sections of the pipe.

To assemble the ends, work the discs in place and wrap with rubber band set in the grooves. To operate, hold the nozzle in one hand and work like an accordion.





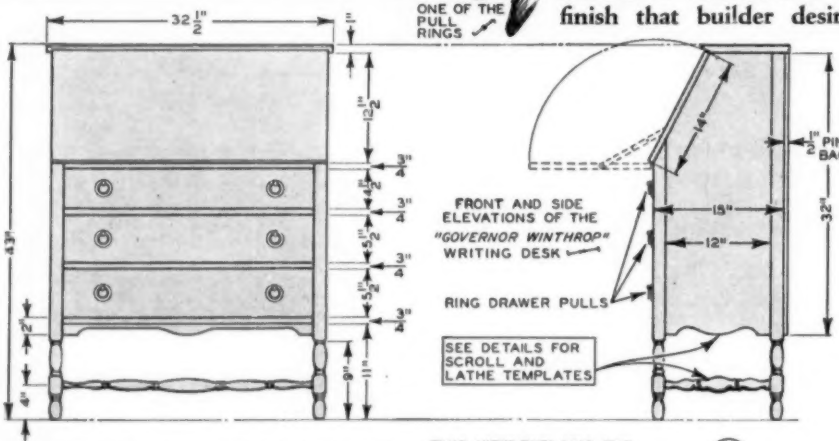
Here's how the pipe is fitted into end of wooden disc on end of the tube.

The little shop bellows produces a powerful blast when the end is pushed in and pulled out, in the manner of an accordion, as demonstrated in the photo above. Dimensions for all necessary parts are seen in the drawing at the left. Two ends are turned down on lathe and grooved to take the rubber bands which make the bellows airtight. The pipe nozzle passes through hole in one end of the discs. One end of this pipe should be slit with hack saw, while the other is formed into cone with ⅛ in. opening by heating over a blow torch flame and then pounding.

GOVERNOR WINTHROP DESK

is EASY *to* BUILD

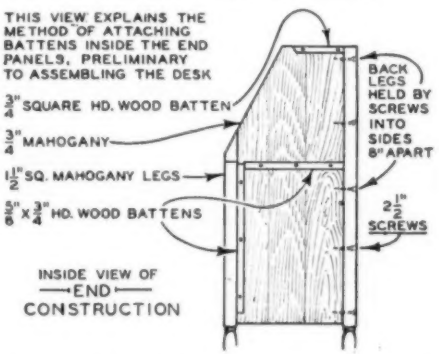
The novice cabinet worker can do a first class job on this Governor Winthrop desk, which will make an attractive addition to your living room or library. It can be built at a very small cost from mahogany, walnut or maple and stained or varnished to the finish that builder desires.



The above diagram shows how the desk will look from the front, giving the complete over-all dimensions and indicating the exact space taken up by constituent parts.

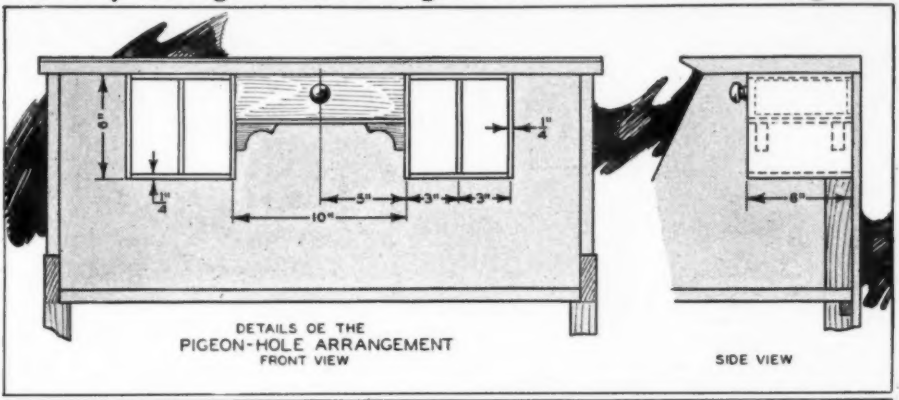
THIS Governor Winthrop desk is an excellent design for the home craftsman to work on. Only the simplest tools are required, with the exception of the lathe work on the legs and stretchers. If you haven't a wood lathe of your own to turn these out on, they can be purchased at a very small cost.

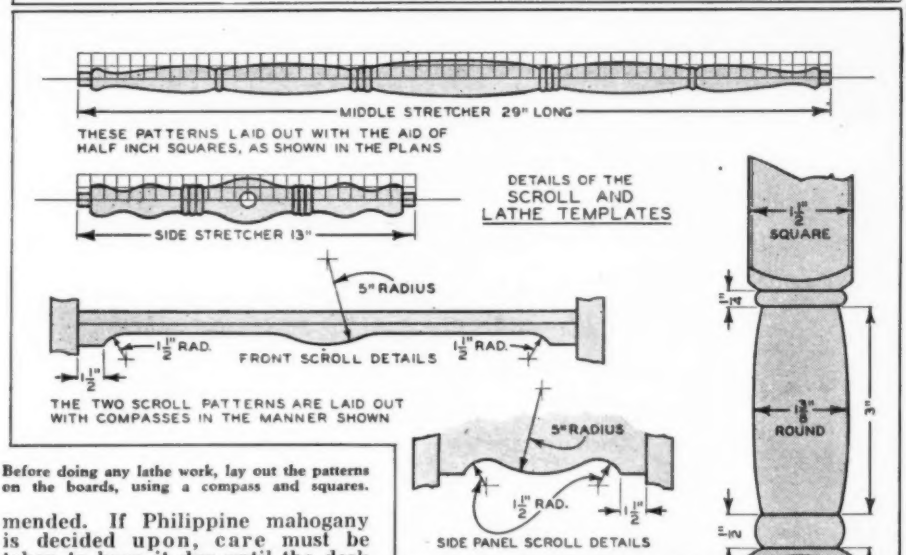
There is not a mortised joint in the entire desk and yet, to all appearances, it is a first class job in every respect. The original, shown in the photograph at the top of the page, was built of Philippine mahogany. This is the least expensive of the better woods, but South American mahogany, maple or walnut are also recom-

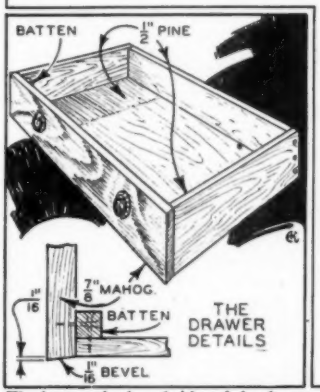

THIS VIEW EXPLAINS THE METHOD OF ATTACHING BATTENS INSIDE THE END PANELS, PRELIMINARY TO ASSEMBLING THE DESK
3/4" SQUARE HD. WOOD BATTEN
3/4" MAHOGANY
1 1/2" SQ. MAHOGANY LEGS
9/16" X 3/4" HD. WOOD BATTENS
BACK LEGS HELD BY SCREWS INTO SIDES 8" APART
2 1/2" SCREWS
INSIDE VIEW OF END CONSTRUCTION

These two views show the side construction of the desk.

Details of the Pigeon-hole Arrangement Installed in the Writing Desk




MIDDLE STRETCHER 29" LONG
THESE PATTERNS LAID OUT WITH THE AID OF HALF INCH SQUARES, AS SHOWN IN THE PLANS
SIDE STRETCHER 13"
DETAILS OF THE SCROLL AND LATHE TEMPLATES
5" RADIUS
FRONT SCROLL DETAILS
THE TWO SCROLL PATTERNS ARE LAID OUT WITH COMPASSES IN THE MANNER SHOWN
SIDE PANEL SCROLL DETAILS
SQUARE
ROUND
ROUND
TURNED LEG DETAILS



Before doing any lathe work, lay out the patterns on the boards, using a compass and squares.

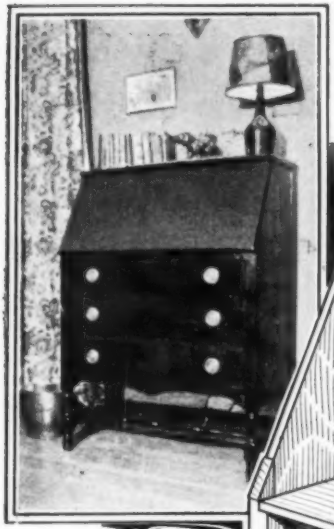
mended. If Philippine mahogany is decided upon, care must be taken to keep it dry until the desk is finished, as the surface has a tendency to "feather" and sanding will be rather difficult.

The first operation is to cut the two side pieces ¾" x 12" x 32". This can be done with a coping saw or by having a mill cut them to your pattern. Next cut two pieces 42" long and two more 32" long from 1½" square stock for the front and rear legs respectively. The lower ends are turned to the pattern illustrated in the accompanying diagram.

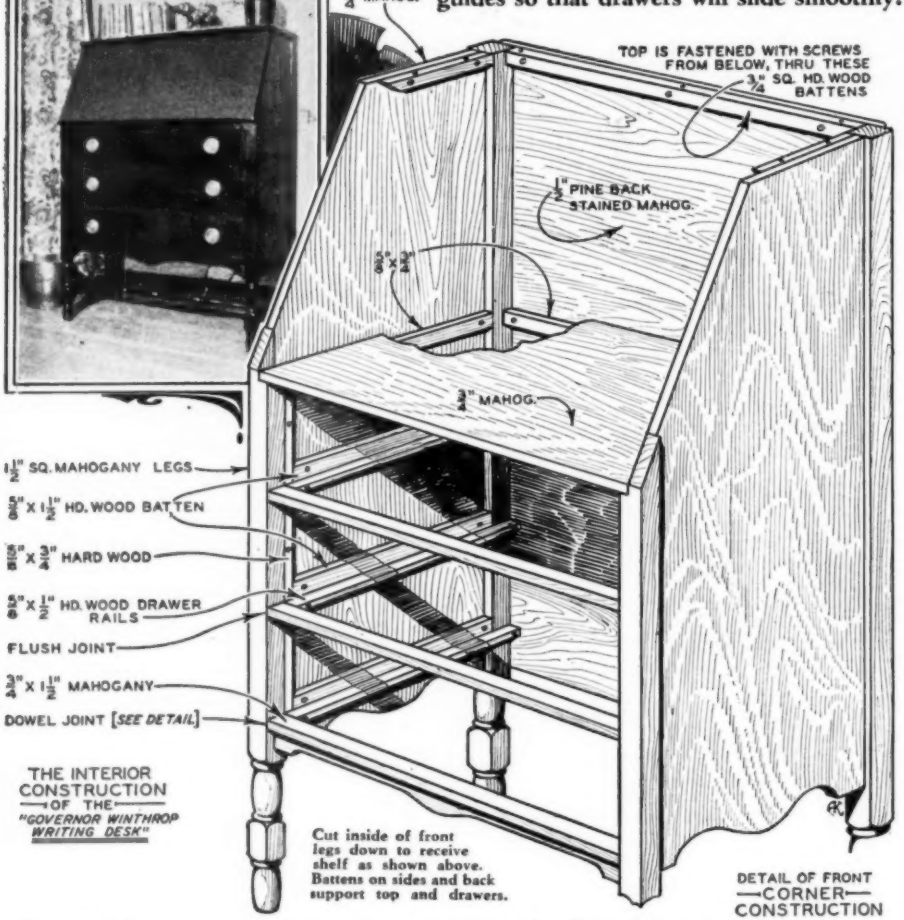
The first step in assembling is fastening the side boards to the legs. The legs are set so that they extend about ¼" on the outside to form a panel effect. Secure the rear legs to the side board with 2½" flathead wood screws, countersunk

The bottom, back and sides of the drawers are made of ½-inch pine.

Showing the Interior Construction of the Governor Winthrop Desk



Your completed project will only be as good as its interior construction allows. Make sure that every brace and joint is close-fitting and solid. Pay special attention to the drawer rails and guides so that drawers will slide smoothly.


3/4" MAHOG.
TOP IS FASTENED WITH SCREWS FROM BELOW, THRU THESE 3/4" SQ. HD. WOOD BATTENS
1/2" PINE BACK STAINED MAHOG.
5/8" X 3/4"
3/4" MAHOG.
1 1/2" SQ. MAHOGANY LEGS
5/8" X 1 1/2" HD. WOOD BATTEN
5/8" X 3/4" HARD WOOD
5/8" X 1/2" HD. WOOD DRAWER RAILS
FLUSH JOINT
3/4" X 1 1/2" MAHOGANY
DOWEL JOINT [SEE DETAIL]
THE INTERIOR CONSTRUCTION OF THE "GOVERNOR WINTHROP WRITING DESK"
Cut inside of front legs down to receive shelf as shown above. Battens on sides and back support top and drawers.

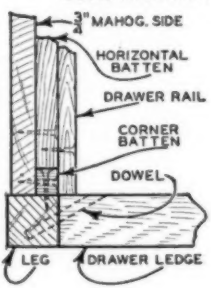
and spaced 8" apart. Attach front legs by means of a 5/8" x 3/4" hardwood batten screwed to both side board and leg. Apply glue liberally before screwing down permanently and let set for 24 hours.

Complete the assembly guided by the above diagrams. For the pigeon holes, mahogany plywood is very satisfactory. If a plain wood is used, it should be at least 1/4" thick, glued and nailed together and secured to the top with small screws.

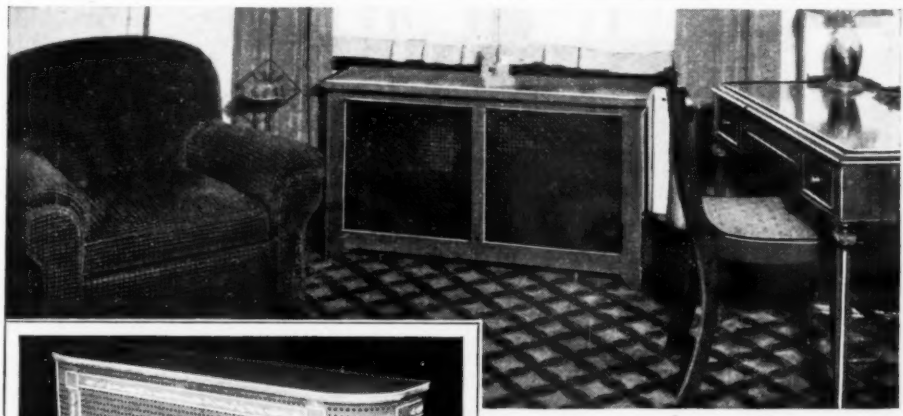
When the desk is ready for finishing it should be thoroughly sanded and filled with wood-filler. Use oil stain and experiment with samples first to get the desired shade before applying to desk. Finish either with shellac or varnish.

Three coats are recommended, rubbing down each coat when thoroughly dry with pumice stone. The final coat should be rubbed down lightly and finished with furniture wax.

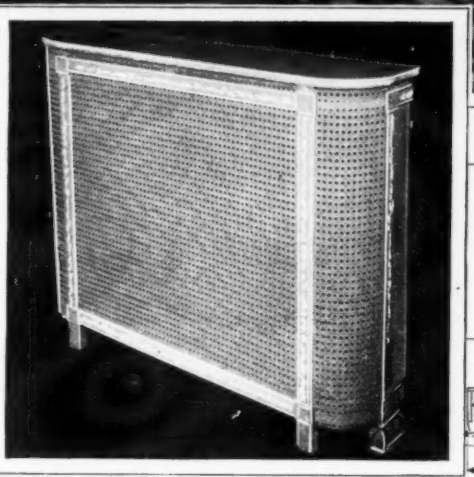
DETAIL OF FRONT CORNER CONSTRUCTION



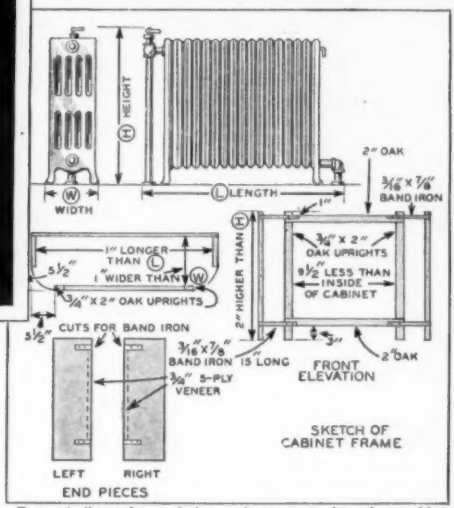
Build Your Own RADIATOR Enclosure



Here's an enclosure done up with square corners. It will make a handy, comfortable window seat.



Note striking design of this round-cornered enclosure. Molding greatly enhances the beauty of the object and should be selected with an eye to harmony with other furniture.



General dimensions of the enclosure are given here. Note that height, width and length are determined by first measuring the radiator and then adding one or two inches.

WHY not build your own radiator enclosures? The job is surprisingly easy, and if you're a craftsman of moderate skill you can have a cover that looks as good as any $50 or $60 factory-built article.

The accompanying drawing will start you out on the job. It shows the essentials of a good enclosure, but you'll have to work out the details yourself.

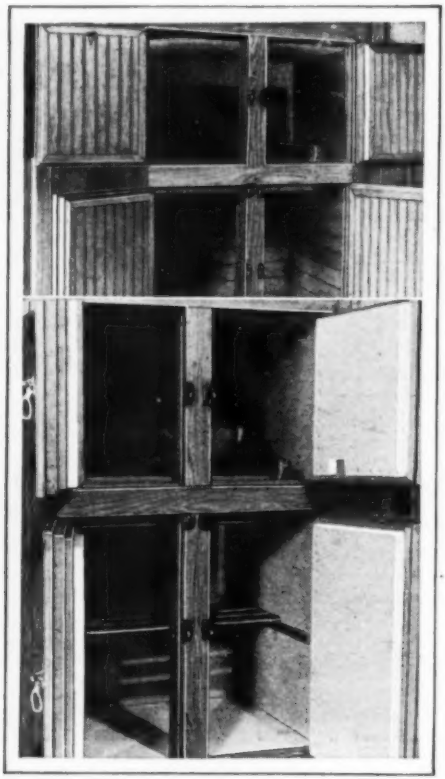
Cabinets, as the above photo shows, may be either square-end or curved-end construction. The material used is ¾ in. 5-ply veneer for ends and top. Kiln dried ¾ in. by 2 in. oak or white pine is used for the front panel frame. The grille used is perforated steel of 22 or 24 gauge and may be bought through your local metal shop.

General dimensions are given in the drawing. The front frame, you will notice, is to be connected to the end pieces by ⅞ by 7/16 in. band iron, which fit flush in cuts in the end pieces. The grille also demands that a thin layer of wood be cut out of the ends for a flush fit over the wood.

To support the rear edge of the top use a steel angle bar about ¾ in. by 1¼ in. or larger if the enclosure is a low one and is to be used as a seat. A generous application of molding will greatly enhance the beauty of your job, as the photo above proves.

Now as to finishing the grille. Pyroxolin spraying lacquer is ideal for the job, and it can be applied very easily. A sprayer will cost you less than two bucks, and will come in handy when you're brushing up your car. MODERN MECHANIX AND INVENTIONS will furnish you with purchasing data.

Money Making IDEAS That



Above—Refrigerator before application of Insulite. Below —After insulating material had been applied throughout interior, reducing ice consumption more than 50 per cent.

THAT mechanical ingenuity is a distinct and highly profitable asset in times such as this, when millions of men are out of work, is proved conclusively from four stories which have emerged from news of the past month.

These four stories each told of mechanics who capitalized on their talents, the services offered to the community varying from operating a freak "water taxi" to insulating ancient refrigerators. All the schemes to knock off extra cash, or even provide the entire family revenues, are gathered here, and we pass them along to you as money making hints.

First off the reel comes the story about the refrigeration insulation stunt carried on with sizeable profits by one mechanic. What he did you can do.

Now in many old houses and stores there are built-in refrigerators which waste ice like a toad wastes hops. The ice box with which we are concerned was brought to attention through complaints that it consumed about 75 lbs. of ice per day in hot weather.

As the photo above shows, this ice box was framed, boarded up and lined with tongue and groove material. The front of the box was fitted with four hollow doors—which was two too many. Four of the six surfaces of the box were exposed to voluminous air currents, and had the protection of no insulating medium whatever. Is it any wonder the box had an insatiable thirst for ice?

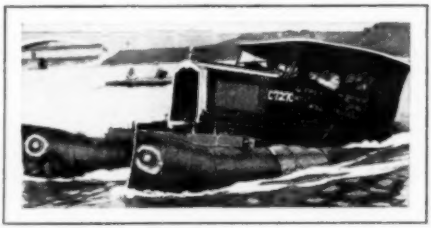
Now in the cure which was effected you will find some ideas on how to proceed on your own jobs. Every bit of the inside of the box was lined with Insulite. The inside surfaces of the front doors were covered as well as the inner surface of the icing door at the left end. The pieces of the insulite were cut for their respective surfaces to fit so snugly that they were self-supporting. Shingle nails, indented 1/16", will hold the sheets firm.

Now the refrigerator was a refrigerator and not a mere box for holding ice. With the completion of the aforementioned labor the refrigerator was again put into use, and given a fresh charge of 100 lbs. of ice to work on. It was found that the insulation had reduced ice consumption nearly 50 per cent, making the job well worth while.

The problem of painting the inside of the refrigerator was solved by deciding not to paint! To finish the interior would have meant a coat of sizing followed by either "cold storage enamel" or aluminum paint.

Observation has shown no evidence of any effect of moisture on the Insulite.

By digesting this article and putting additional thought on the subject you can prepare yourself profitably to undertake as many similar jobs as can be unearthed in your locality. To lay out an efficient program of so augmenting one's income, the soliciting of such construction work should be done in the late summer and fall when prospects are most aware of the amount of money that has been spent for ice.



The "Fresh Water Taxi" in which Isadore Cholfin, of Somerville, Mass., takes sight-seers on tour along Charles river.

WHIPPED the DEPRESSION

IF A leather medal were awarded for novelty in devising unique, not to say humorous schemes for making money, it would undoubtedly go to Isadore Cholfin, of Somerville, Massachusetts. What Isadore rigged up to bring in the extra shekels he has dubbed the "Fresh Water Taxi."

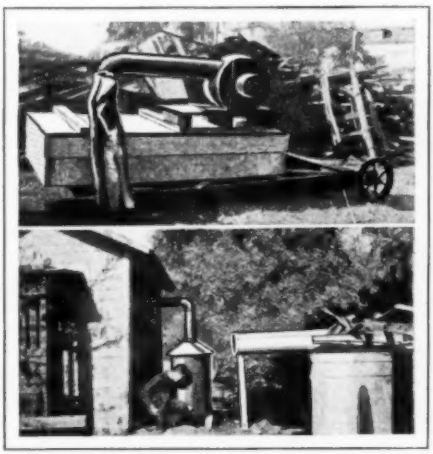
The thing is shown in the photo at the bottom of the opposite page, so you can raise no reasonable doubts about its navigating abilities. The superstructure, deck, engine room, pilot house, and all the other things a ship has is, in the case of the "Fresh Water Taxi," merely the body of an old auto that has seen better days.

As to the hull of the taxi-ferry that is a bunch of old oil drums welded together into a couple of substantial pontoons. Steering is effected through the regular steering wheel, which is attached to the rudder.

Isadore is doing a thriving business hauling sight-seers along the Charles river. Taking a tour is really an adventure, judging from the looks of the craft.

Who would believe that the manufacturing of lampblack would yield a nice income? To James Coggswell, a sixteen year old Pasadena, California, schoolboy, goes the honor of devising a method of small scale manufacture of this product which brings him in sufficient revenue to buy clothes needed in connection with his attendance at the Southwestern Military Academy. In addition he has plenty of weekly pocket money from his labors.

The product of Coggswell's plant is packed in paper bags and finds a ready market among local cement contractors.



James Coggswell's back yard factory in which he manufactures lampblack to sell to cement contractors. They use his product to tone down whiteness of cement on walks.

More business than can be handled is brought in by attention drawn to this grinding machine, which is mounted on side of car and powered from motor through fan belt.

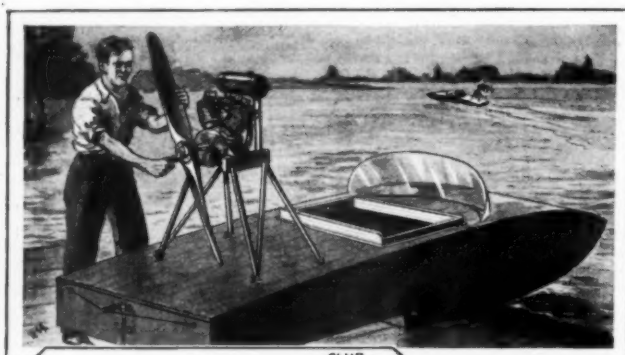
They use it to tone down the glare of the too-white concrete in highway and sidewalk construction.

The plant may be seen in the photo at the bottom of the page. The manufacturing process is as follows: Crude oil is first burned in a drum wherein the supply of oxygen is controlled by means of dampers. This incomplete combustion releases a heavy black smoke made up of carbon particles which is drawn off by a suction fan and blown into a series of settling chambers. Here screened baffle plates allow the carbon particles (lampblack) to be dropped in the collecting bin, while the gases pass through and escape. The lampblack is then scooped up and bagged.

The grinding stunt is an old stand-by, but it has remained for an auto-owner in Cleveland to exhaust its possibilities. What this particular motorist did was to devise a portable grinding unit, so designed that it could be fitted right on the mudguard of the car, as illustrated in the photo at the top of the page. Power for operating the wheel is taken from the engine of the car by means of a belt and an extra pulley installed immediately in front of the fan belt.

The grinder is not only very efficient but very economical as well, for gas consumption is very small due to the small load. The novelty of the device always causes a crowd to collect as the grinder makes his rounds throughout the town. This form of advertising brings him more business than he can handle. The device is readily removable, thus permitting the car to be used for pleasure purposes after business hours.

Build Hydroglider, Ice Boat



Propellers for hydrogliders, ice boats, etc., that appear to come right from a factory, can be built in your own workshop by following the directions given here. Complete details for the job are set forth —all you need are the tools and a little ability.

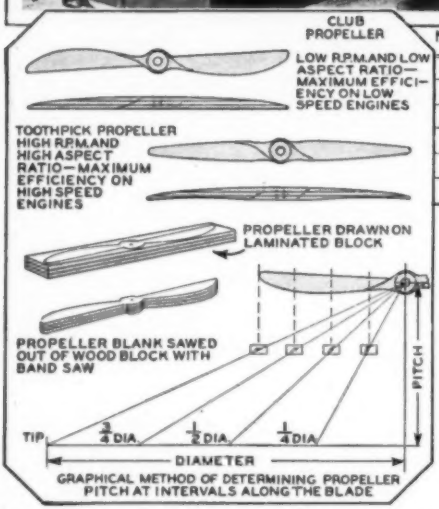

CLUB PROPELLER
LOW R.P.M. AND LOW ASPECT RATIO— MAXIMUM EFFICIENCY ON LOW SPEED ENGINES
TOOTHPICK PROPELLER HIGH R.P.M. AND HIGH ASPECT RATIO—MAXIMUM EFFICIENCY ON HIGH SPEED ENGINES
PROPELLER DRAWN ON LAMINATED BLOCK
PROPELLER BLANK SAWED OUT OF WOOD BLOCK WITH BAND SAW
PITCH
TIP
¾ DIA.
½ DIA.
¼ DIA.
DIAMETER
GRAPHICAL METHOD OF DETERMINING PROPELLER PITCH AT INTERVALS ALONG THE BLADE

Fig. 1. Two conventional propellers suitable for use on ice boats and hydrogliders are shown at top. Props are built up from laminations, shape being determined by graphical method illustrated below. Diameter line shows only four divisions, but eight are used in laying out prop.

NAME OF ENGINE	H.P.	R.P.M.	PROP. DIA.	PROP. PITCH
FORD MODEL A	40	1800	72"	42"
HEATH HENDERSON	27	3000	54"	42"
LAWRENCE 28	28	1750	60"	48"
INDIAN CHIEF	22	2500	51"	40"
HARLEY DAVIDSON 74	20	2000	51"	40"
INDIAN SCOUT	18	2000	48"	36"

Propeller pitch, diameter may be determined from this table.

by ROBERT L. DUMAS

IT IS generally believed that propeller making is a difficult process requiring a complicated machine and skilled operator. This is not the case, however. An amateur can make a very efficient propeller by doing his work carefully and accurately.

The success of the propeller depends on his accuracy. It is advisable that the airplane propeller design be purchased, as it is engineered down to a fine point too technical for explanation here. The design and complete working drawing in the form of a blue-print may be purchased at a very reasonable price. The following design information, however, will prove very practical on propellers to be used on ice sleds, boats, hydrogliders, etc.

The first consideration in designing a propeller is the number of r.p.m.'s it should turn to enable the engine to develop its maximum h.p. The number of r.p.m.'s are governed principally by the pitch and diameter of the propeller. This information for various engines may be obtained from the table. (Fig. 2.)

Some engines turn clockwise and some counter-clockwise, therefore the propeller must be made accordingly.

After the pitch and diameter have been determined, the shape will next enter into the problem. Two conventional propeller shapes are shown in Fig. 1. The club propeller, with an aspect ratio of approximately 6, will produce more thrust on engines turning less than 2000 r.p.m. All engines turning over 2000 r.p.m. should be equipped with a toothpick propeller with an aspect ratio of approximately 8.

Don't Gear Down Propellers

Some believe that the above speeds are too great for a propeller to maintain efficiency, therefore they try to reduce the speed by gearing the propeller down slower than the motor. This is a mistake. The tip speed of a 4-ft. propeller turning 2000 r.p.m. is the same as the tip speed of an 8-ft. propeller turning 1000 r.p.m.

Also, the efficiency gained, if any, would not be enough to offset the power lost due to the friction of the gears.

The diagram showing the graphical

Propellers in Your Workshop

method of determining propeller pitch is practically self-explanatory. (Fig. 2.) The vertical and horizontal lines are drawn to scale to represent the pitch and propeller diameter respectively. The horizontal line is divided into four equal parts.

By drawing straight lines from the top of the vertical line through these division points, the correct pitch at intervals along the blade will be found.

Upon finishing the working drawing you are ready to begin the construction of the propeller. Since spruce is the strongest known wood for its weight and is also easily worked, this would be the logical choice of woods.

Birch, Black Walnut Best Woods

On the other hand, should you desire something more elaborate, the two kinds of wood most widely used for this purpose are birch and black walnut.

The propeller is made up of layers of wood ¾ inch thick. These layers are laminated (glued) together under a pressure of not less than 150 lbs. to the square inch. The glue should be allowed to set at least 12 hours.

The outline of the propeller is then traced on the laminated board, which is sawed out with a band saw, or if that is not available, a jig saw will serve the purpose. This wooden form is called a propeller blank, and is ready to be carved.

Before beginning the actual carving, make a set of light gauge sheet aluminum templates. These are made to an exact likeness of the propeller blade profiles in your working drawing. When finished the templates should look like the profiles shown in Fig. 3.

In order to hold the propeller secure without damaging it while carving, a hardwood block about 1″x2″x4″ is bolted to the hub with a ⅜″ bolt. This block, with propeller attached, is then held securely in a vise. Begin carving by roughly cutting down the flat side of the blades first.

A draw knife or similar instrument is used for this purpose. Both blades being carved roughly, they are then smoothed down with a spokeshave and tested with the templates. The high places are then scraped and sandpapered. This process is continued until the templates fit snugly in place.

If the propeller is made of spruce, at

Above photo shows templates in place for shape test. Below—Applying linen.

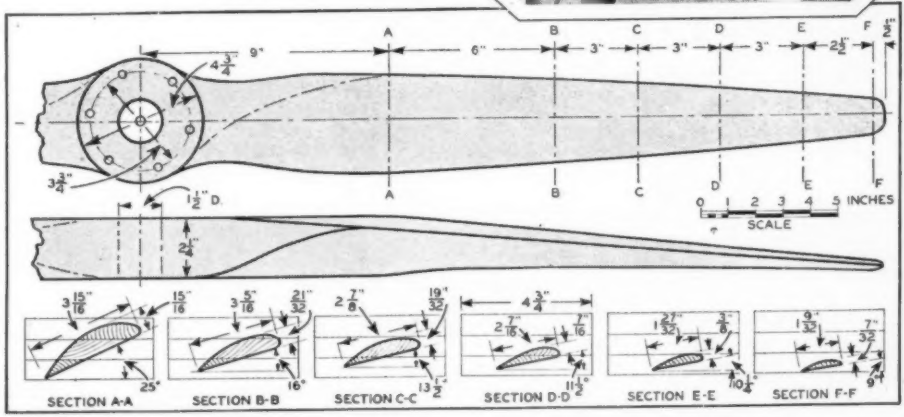
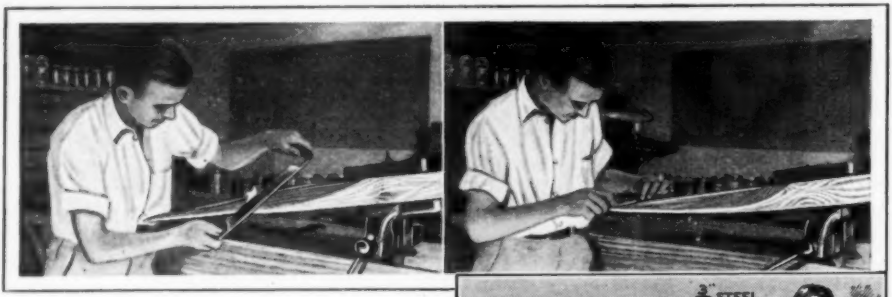


Fig. 3. Here is sample set of templates for toothpick propeller. They are made from light gauge aluminum, and to exact likeness of prop blade profiles in working drawing. Photo at top shows how templates are applied to blade in shape test.

Cut Blades to Shape With Drawknife—Smooth Off With Spokeshave



Heavy cutting is done with a drawknife as demonstrated here. First both blades are shaped down roughly, and then smoothed off with spokeshave as illustrated top right photo.

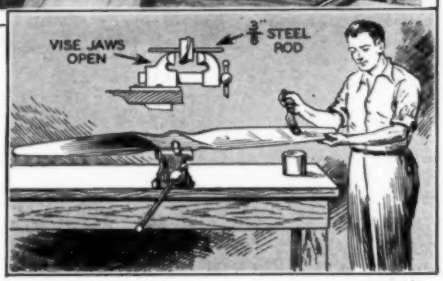
least three-fourths of each blade must be covered with linen or grade "A" airplane fabric, doped on. This is not necessary for the hardwood propeller, although it is desirable that it be tipped to prevent splitting.

Upon completion the spruce propeller is given 4 coats of dope. The hardwood propeller is sanded smooth with No. 00 sandpaper and then varnished.

Balancing the propeller is next. This should be done in a place where the air is perfectly still. A vise will serve as a balance stand. The top of jaws must be smooth and level. A short length of ⅜-inch steel rod is passed through the ⅜" hole in the propeller hub.

The propeller is placed horizontally in the vise and is supported by the rod, each end of which rests on the jaw of the vise. If the propeller does not balance, the light end should be coated with varnish or dope, depending on the finish, until it does balance evenly.

In order to insure perfect tracking, it is necessary that the hub be bored on a drill



Balancing the prop is accomplished as demonstrated above. Note that steel rod supports blades in between vise jaws. If one is little overweight, balance with little varnish or dope.

press. This being done, the propeller is mounted on the motor and tested for track in the following manner: Turn the propeller until it is vertical. Next place a box on the floor so that the lower tip just touches it, then turn the propeller one-half revolution.

If the other tip just touches the box, the propeller tracks perfectly. If the propeller does not track perfectly, it can be made to do so by shimming one side of the hub with sheet aluminum.

Twin Propellers on One Shaft Boost Speed of Motorboat to 65 M.P.H.

Pete DeNichelis and his high-speed dual-drive propellers.

WORKING on the principle that if one propeller's drive can send a motorboat skittering, a dual drive should make it move faster, Pete DeNichelis, San Francisco aeronautical engineer, has developed a dual drive for a motorboat.

The propeller is shown attached to the stern of a motorboat in the accompanying photo, ready for duty. The arrows indicate the direction of the rotation of the propellers, which have an opposite pitch.

In tests conducted in San Francisco Bay, the dual drive system sped a boat over 65 miles per hour. A 17½-foot, flat-bottomed boat has been used for the tests, with twin propellers, one pushing and one pulling, on one shaft, and power d by a 300 horsepower airplane motor.

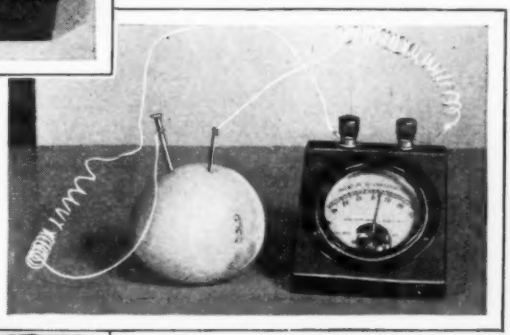
The drive is adaptable to any style of boat, particularly those below 50 feet in length. Steering, the tests disclosed, is much easier.

Some Strange SOURCES of Electric Current

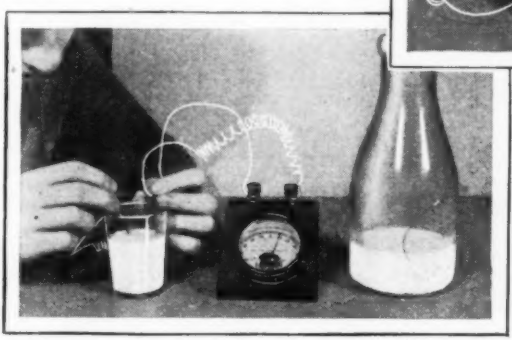
Battery From Human Perspiration. The slight degree of acidity in human perspiration is sufficient to cause a rather large electric current to flow when two small electrodes are placed on a moist part of the arm. Dry skin will not produce any electricity whatever, as there is no chemical between the elements.

The Tongue Battery. Even life is electrical and all living things generate a small amount of current. Here is an experiment which demonstrates that the human tongue may be used as the active element of a battery. The electrodes are simply laid on the tongue in the test. No shock whatever will be felt.

The Coin Battery. A small piece of ordinary blotting paper moistened with the tongue and placed between one silver and one copper coin will generate a rather powerful electric battery when one considers the size of the materials used. Try it some time on your milliammeter, which must be low-reading.



The Orange Battery. A copper and an iron electrode pressed into an orange show that a rather large current may be generated by this curious combination. An apple also may be made to generate, what is for an apple at least, a great amount of current, practically twice that developed by the orange. Fruit batteries of considerable strength may be made by series hook-up. Left—**The Milk Battery.** That cow's milk may be used as a source of current will surprise many electricians.



Build Your Own ENLARGER

Clear large-size pictures made from vest-pocket camera negatives.

Fig. 1. This photo showing completed enlarger demonstrates how the machine is operated. To focus turn on the light in the lamp house and lift the negative carrier until the enlargement comes up to the desired size. Mount the upright on any substitute board available for the purpose.

DURING the past two years miniature "precision" cameras have attained unusual popularity. The range in negative sizes is from that of a motion picture frame the size of a postage stamp to the well known "vest pocket" size. The short focus lenses produce sparklingly clear negatives low in cost and capable of more than usual enlargement.

An inexpensive enlarger especially designed for use with the tiny negatives is shown at the top of the page. In precision and quality of work it compares favorably with the new cameras. Measurements given in the drawing are suitable for all classes of miniature negatives.

Accuracy in Making Arms Essential

The upright is first grooved to a depth of 1½" (as shown in Figs. 3 and 4) to take the adjustable arms which are made of three-ply veneer strips ¾" wide. These must be kept the same distance apart at both ends where they fasten in place with dowels (Fig. 4).

Accuracy in this is important so that the negative carrier, etc., will be absolutely level at any height.

The negative carrier is in two parts (A and B in Fig. 3), the top part hinging with a dowel to the lower and supporting the lamp house. Part B has a space 1⅝"x2½" removed from the center on the scroll saw, and the edge routed out (Fig. 5) to make room for two sheets of thin negative glass.

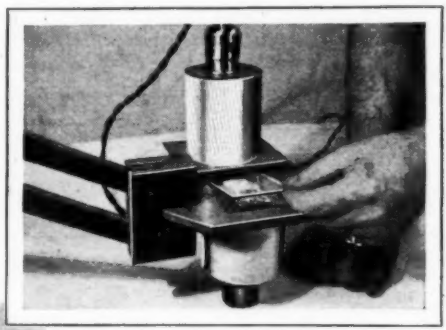


Fig. 2. To place negative in the holder, swing the lamp house aside and raise the glass as demonstrated here. Then swing house back into position and adjust for height. Lens mount is seen below.

In the model illustrated the lamp house was made with a cardboard tube well treated with sodium silicate solution to make it fireproof, lined with tinfoil inside and supplied with vent holes for a circulation of air.

The holes must be concealed so as to be light-tight. One of the small high-power lamps from a cine projector was used. By making the tube considerably larger the very efficient photoflood lamp can be installed.

The lens mount is another tube that can be telescoped for focusing and fits around a slightly smaller tube covered with black felt. The lens was taken from the camera making the negatives. If a permanently mounted lens is installed it should be of approximately two-inch focus for miniature negatives.

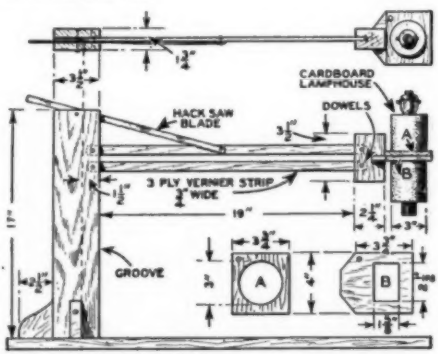


Fig. 3. Here are dimensions for enlarger. Part B pivots on dowel through holes in upper left corner of parts A and B.

for Miniature NEGATIVES

Fig. 4. Adjustable arms, which must be kept same distance apart at both ends, fasten in place with dowels. Note how the upright is grooved. Arms are made of 3-ply veneer.

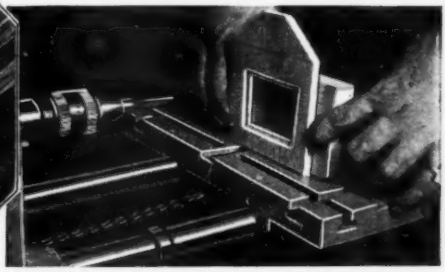


Fig. 5. Part B shown in Fig. 3 is routed out to make room for two sheets of thin negative glass. The negative to be enlarged is placed between these two sheets of glass. Fig. 6, at left above—Hacksaw blade punched at intervals serves to hold the enlarger at desired height.

The negative holder is adjustable for distance from the table on which the enlarger is mounted by means of the "rack" from an old camera or a coarse toothed hack saw blade, shown in Fig. 6.

Screw the upright to a table for permanent mounting, or to a kitchen "dough" board for portable mounting. Negatives are placed between two glasses in the simplified holder by merely sliding the lamp house to one side (Fig. 2).

To focus the enlarger turn on the light and lift the negative carrier until the enlargement is of the desired size. The hack saw blade catching on the nail driven through the top of the upright will hold it steadily in that position. Then focus the negative sharply by moving the telescoping lens tube up or down. The exposure will average between three and ten seconds, depending on the type of lamp used and density of the negative.

With the usual tiny negatives diffusion of the light will not be necessary. Larger negatives require that a sheet of glass, to which is fixed a piece of heavy tissue paper, be placed between the negative and the light. Coat the inside of tubes dead black.

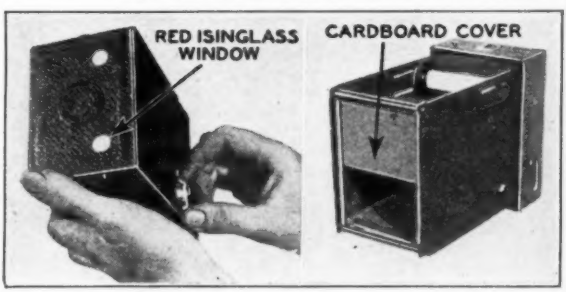
How to Make Twelve Pictures on a Six-Exposure Roll of Camera Film

AN especially economical way to take pictures is to get twelve exposures on an ordinary six-exposure roll of camera film. But slight adjustment of the camera, either the box or folding style, is necessary and it can be quickly changed back to take full sized pictures when desired.

Remove the camera back and fit a piece of heavy black cardboard so that it will cover slightly more than half of the opening over which the film passes. The accompanying photo shows a box camera so prepared. The card is held in place securely by friction and is situated immediately underneath the film runway.

Measure the opening that is left and then make a ⅜" hole in the camera back the same distance from, and underneath, the little red window in which the film numbers appear. Cement a small piece of red celluloid in the new window and camera is ready for use.

To take the first picture adjust the film with the number one in the top window. In taking the second picture turn the film so that the number one appears in the bottom window. Repeat with all exposures.



Left—Camera has extra window in back. Right—Showing how piece of black cardboard is fitted over lower half of opening to cover half of film.

MOTOR MECHANICS

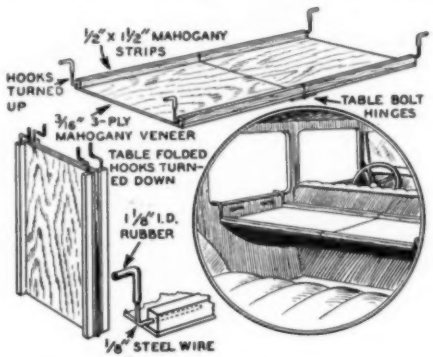
Edited by RAY F. KUNS

Fold-up Tonneau TABLE Rests on Sills

HERE'S about the simplest and most convenient thing yet in the way of tonneau tables. The chief ingredient is a piece of 3/16 in. thick 5-ply mahogany veneer braced by two strips of wood as illustrated at the right.

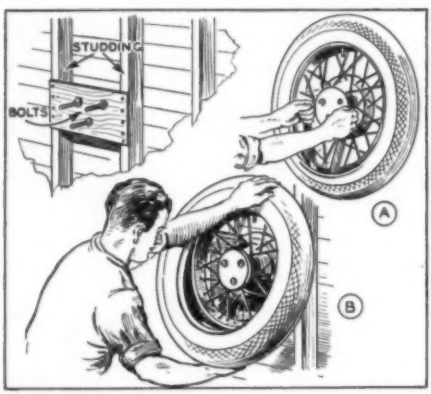
When the table is opened the width of the side strip serves as a butt joint to prevent collapse. The hooks are made from ⅛-in. steel wire, padded with rubber tubing. When the table is folded the hooks are turned down so that the whole contraption is very compact, requiring little room for transportation.

Naturally, this table will want to be made up to fit the particular car in mind. That is, the total length of the table when unfolded, should clear the inside of the car nicely, so that hooks will rest on window sills.



The tonneau table is set in place as shown in the drawing, with ⅛ in. steel wires acting as hooks on the window sill. When not in use the table folds into compact unit.

Wheel Holder for Tire Changes



Removing tires is easy job when wheel is mounted on bolts set in board across studding. A, B show method of removal.

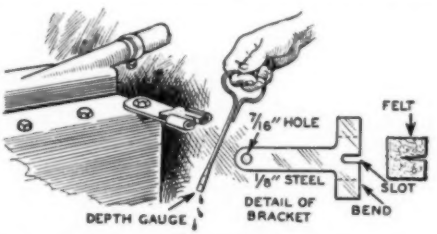
FOR changing tires about the garage the mounting board shown in the drawing above will prove ideal. When removing the tire from a drop center rim, first press the side walls of the tire together to force the bead from the rim flange into the drop center. Next insert the tire iron to start one bead only over the rim, as illustrated at A. Then pull the other bead over the rim flange by allowing the upper portion of the bead to drop into the rim well and by gripping and pulling the tire at the bottom, as shown at B.

Handy Wiper for Oil Depth Gauge

THE careful motorist checks the depth of the oil in the crank case of the motor quite frequently. This type of motorist will find the little device illustrated below a great convenience. It consists of a metal bracket and clip in which is mounted a piece of felt.

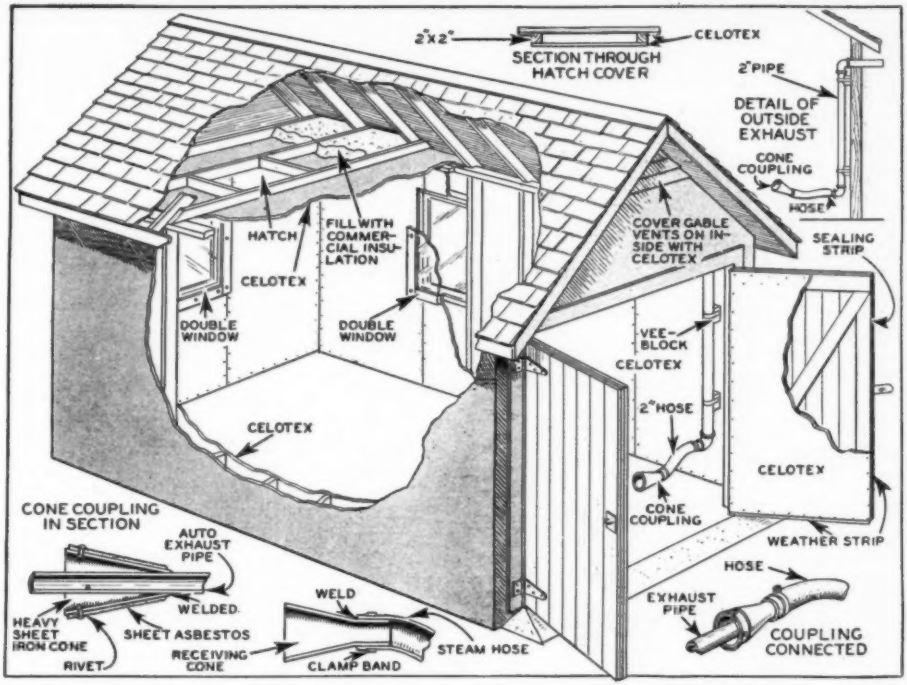
Cut out a pattern of the metal as shown in the drawing and provide a piece of ¼ in. thick felt, which may be clipped between the ears of the metal when it is bent over. Mount the wiper at any convenient place under the hood.

In use, insert the depth gauge into the slot in the felt and pull upward. The metal used for this may be anything from $\frac{1}{16}$ in. to ¼ in. thick. If mounted under a cylinder head bolt, the hole will likely need to be $\frac{7}{16}$ in.



Wipe oil from depth gauge by bringing it up through the slot in the felt. Bracket which holds felt should be mounted on the cylinder head, where it is easily accessible.

Car Keeps INSULATED Garage Warm



Heat radiated by auto motor will keep garage sufficiently warm if you insulate walls, doors, and ceiling as illustrated here. Danger from carbon monoxide is eliminated by pipe vent which carries gas outside when the cone coupling is connected to exhaust. All areas between studding are filled with commercial insulation for further protection.

THE problem of avoiding a frozen radiator without a heater in your garage can be effectively solved by proper insulation. There are several brands of insulating board which will not only keep in the car warmth, but also vastly improve the neatness of your garage. Double windows and weather strip contribute materially to the complete insulation.

In such closely sealed quarters it is necessary to have some means of carrying the exhaust fumes outside, for on frosty mornings it is important to warm up the motor before putting on any load.

The drawing above illustrates the manner of carrying exhaust gases outside through a two-inch pipe. A length of steam hose or flexible steel tube of 1½ in. or 2 in. inside diameter is connected to the lower elbow, and a gas-tight joint is made on the end of the exhaust pipe by means of two cones, one of which fits over the other, insuring a tight connection without tools or clamps.

Note in the drawing that a heavy sheet-iron cone is welded to the exhaust pipe and covered with sheet asbestos. Wrap several layers around the cone and rivet in place. The receiving cone is welded to a short length of pipe, which is inserted in the hose and held in place with a band clamp.

The entire inside as well as ceiling of the garage should be covered with Celotex, Insulite, or similar board. The insulating board will be found more effective if nailed to ceiling joists than directly to the rafters.

Construct a hatchway above the rear end and provide an insulated hatch-cover, as shown in the sectional drawing. Wire for lighting, and board over the portion of floor to be used, after having filled in between joists with loose commercial insulation. Vents in the gables should be covered with insulating board on the inside during the cold weather.

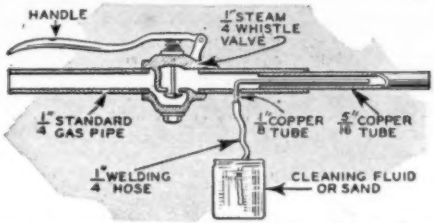
Double windows should be installed on the inside, so there will be an air space between the two panes, and the doors should be constructed with a double wall as shown. Install weather-strip wherever required.

Ten minutes running of the motor with the radiator shutters closed will generate enough heat to keep the garage well above the freezing point throughout the night, and in the morning it will be possible to start the motor easily and warm it up before going out, without the usual hazard of inhaling carbon monoxide exhaust fumes.

Here's How to Make a "Gun" for Cleaning Your Car Body

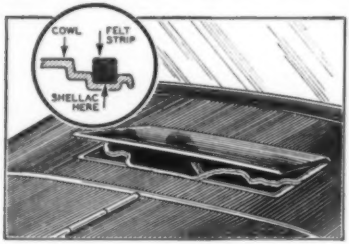
SUFFICIENT material can usually be salvaged from the scrap pile to make the cleaning gun illustrated in cross section drawing at the right. A length of ¼" black gas pipe is drilled with a hole and a piece of ⅛" copper tubing is formed and introduced into it. A length of 5/16" copper tubing is then slipped into the end of the iron pipe and over the end of the ⅛" copper tubing. A ¼" steam whistle valve or other suitable control unit, which has connected to it a suitable fitting to hook to the air line, serves to control the blow gun.

The ⅛" copper tubing is connected to the gasoline by means of a length of rubber tubing. In use the end of the rubber tubing is immersed in a can of gasoline, kerosene or other cleaning fluid, and when the air is admitted through the valve it picks up the gasoline and gives a forceful action which is highly efficient in removing grease or oil.



The same device may be used with fine sand for cleaning parts. The latter is very desirable when cutting rust or paint from parts when cleaning. Parts may readily be cleaned for soldering by this method.

Felt Strip on Cowl Ventilator May be Glued in Position With Shellac



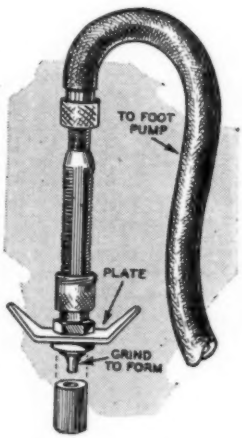
THE felt strip which is used in the cowl ventilator ofttimes becomes loosened and misplaced. If trouble is experienced with the strip working loose and coming out, first lift it out of the groove completely, using a stiff brush to clean out any accumulation of dirt from the bottom of the groove, and then apply a coat of rim and gasket shellac to the bottom, after which place the felt strip in position and close the cowl ventilator down on it to hold it there until the shellac has had a chance to dry. If the felt is too far gone from effects of weather, replacement will, of course, be necessary.

Shrader Tube Serves Many Purposes in Repair Kit

IF THE car owner will take a tube stem from a discarded inner tube and form it as shown in the accompanying drawing, he will have a most convenient tool for use in servicing his car. All that is necessary is to move the plate up on the valve stem a short distance, cut off the lower end of the tube stem and grind it, or file it to the form shown. A short length of rubber hose is slipped over the top. The valve inside is allowed to remain in the tube stem.

Such a device is quite handy for use when trouble is experienced with the vacuum tank. By inserting this tool, with the rubber end over the very small hole found in the cap of the main tank, enough pressure may be quickly forced into the main tank to cause the gasoline to flow forward into the vacuum tank.

The same device may be used for blowing out fuel lines or blowing out carbon when scraping the cylinders.



Glass Jars Carry Tourists' Eats

CARRYING glass jars on an auto camping trip is not so easy. However, if shelves are provided in the cupboards which are exactly as far apart as the glass jar with its tin cover is high, and if uniform size jars are used, then the jars cannot be shaken up and down. In order to prevent them from jarring against each other and breaking, an inner tube can be used. Cut sections from it and slip them over the central part of the jar, as illustrated. Have the cupboard just wide enough to take the desired number of jars. The shelves are just deep enough to allow the lid to touch the front of the jar, as it is closed. Thus it will be seen that every part of the jar is protected from shaking or collision.

Flippers for M-M "Puddle Ducks" Speed Pace Over Water

DID you build the "Puddle Ducks" that were described in the August issue of MODERN MECHANIX AND INVENTIONS? If so, you'll find these "flippers" will contribute to your speed when you're traipsing over a lake or river. They're far superior to the double-bladed paddles most commonly used.

You'll find plans in the drawing at the right. Two round poles of white pine or spruce 1⅛ in. in diameter and 6 ft. long form the backbone of the flippers. Round the upper ends smoothly for a hand grip and attach the wrist thong to prevent loss when you're under way.

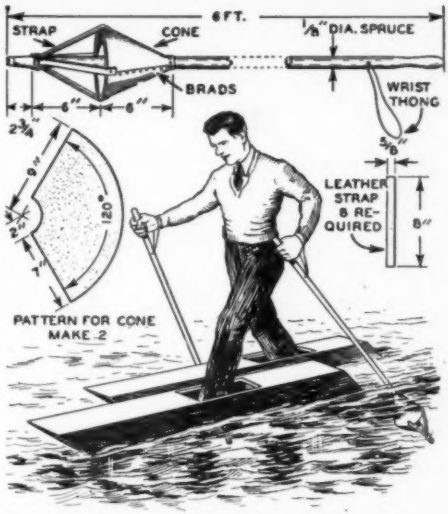
Next cut two sectors from ordinary oak or chrome tanned leather, about 3/32 in. thick, such as you can get from any shoe shop. Lap the edges ½ in. and rivet the lap with copper rivets. This will give two cones about 6 in. high and 6 in. diameter.

Next get the eight straps of oiled or waterproof leather such as is used for belting. Light brass chain will also suffice here. Rivet four straps to each cone at equadistant points.

Now for assembly. Wet the small end of the cone so it will stretch enough to slip upon the stick. Then fasten the cone and the straps to the stick with small brass screws and bind with copper wire.

The ends of the flippers should be tapered to a blunt point and protected with a metal ferrule cut from any handy bit of tuning or pipe.

The modus operandi is illustrated in the accompanying drawing.



Collapsible cone and straps, made of oiled leather, are attached to the 1⅛ in. diameter spruce stick to make the flippers. When traipsing over lake, simply let flippers trail along in water, and swing arms as if walking briskly.

Roller Portage for Kyaks

Canoe is portaged over falls on series of rollers as shown

FROM Germany, where kyaks are quite popular, comes a new idea in portages. When the boatman comes to the falls across one of the rivers in South Germany, he simply lifts his craft onto an inclined platform erected alongside the stream and slides it over a series of rollers to the lower part of the river. How this portage is accomplished is demonstrated in the photo above. There's a minimum of labor involved and no damage to the boat. Any boating fan can easily duplicate the stunt at a difficult part of a river.

Motorcycle Has Metal Body

NOW the midget auto has merged with the motorcycle, and out of the union there has arisen a hybrid that takes all honors for uniqueness in the way of vehicles. The thing is shown in the accompanying photo.

The body is all metal, weighing less than 180 lbs. At the bottom of the sides, where the steps of a respectable auto would ordinarily be, there are a couple of arms projecting downward which serve as rests when the car is not in motion.

A two-cycle engine drives the vehicle along at a fair clip. The whole of the tail section of the car is sprung, resulting in a great improvement in comfort. The design was worked out by A. N. Silva, a Gloucester, England, inventor.

A hood above the dashboard protects against brisk breezes, while a light on the front illuminates the roadway ahead.

This is really a motorcycle with metal body built over the frame.

To Get Your MONEY'S

Though this five-room house, built from Plan No. 5-W-44 follows no special style, it does have a decided distinction, owing chiefly to its steep roof pitch and exterior chimney. First floor has complete bungalow service.

by MAURICE I. FLAGG

Bureau of Standards tests show that more than 75 per cent of the heat issuing from radiators in your home goes to waste. Insulating materials now on the market, however, will put a quick stop to this, and reduce your fuel bill by half, as explained here.

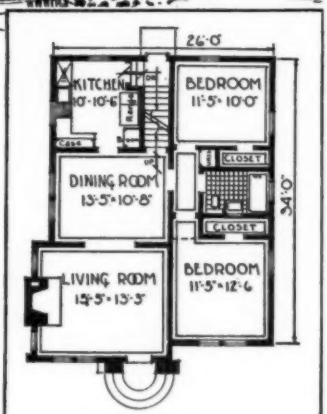
THERE'S hardly a material or piece of equipment in a new house that doesn't begin to depreciate, wear out and require upkeep expense in a year or two.

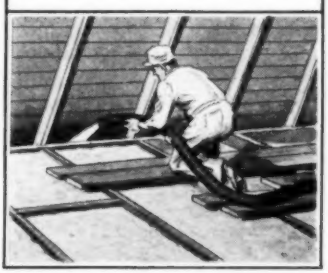
It's different, however, with insulation. It's one material that not only pays for itself through fuel savings but after having done so it continues to pay cash dividends on the original comparatively small investment.

Probably no building material has been subjected to more rigorous tests than insulation. Bureau of Standards tests show as much as 30 per cent heat loss through the roof of an uninsulated house. From 25 to 35 per cent heat leaks through side walls. From 25 to 35 per cent heat flows out through window cracks and doors. After applying ½ inch insulation to roof and side walls and weather stripping doors and windows, a 50 per cent heat saving was possible.

Certainly if you can clip your fuel bill 50 per cent a season and save perhaps as much as $50, if not more, it's worth while to use insulation, for you not only get your money's worth but in the end you get your money back.

Even old houses can be successfully insulated. Manufacturers have devised a means of blowing vermin-proof insulating material down between the studs.





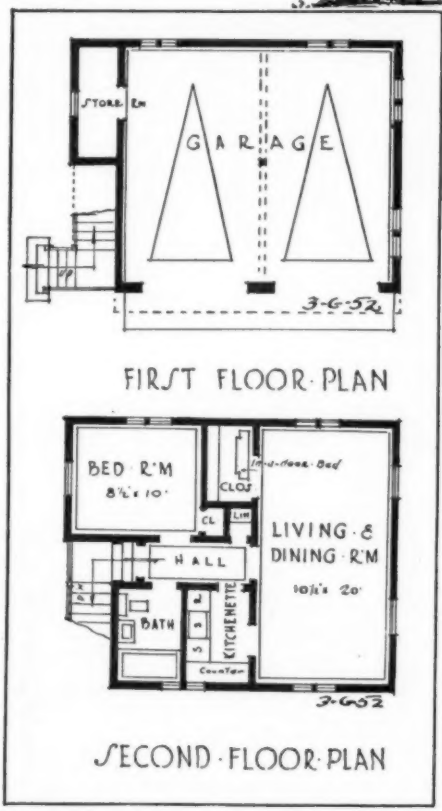
At top is seen first floor plan for house No. 5-W-44. Below—Method of blowing vermin-proof insulation under pressure with the spray gun method into area between studding. Prevents excessive leakage of heat through the walls.

WORTH Use Insulation

HOW TO GET BLUE PRINT AND TWO PLAN BOOKS

A one-sheet blue print of any house appearing in Modern Mechanix and Inventions magazine may be had for $1.00, postage prepaid. Two new plan books, "Homes for Newlyweds," containing 32 of the latest ideas for low cost homes in all styles, and "16 Selected Homes for Lean Purses" containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanix and Inventions Magazine, 529 South 7th Street, Minneapolis, Minn.

Ideal for family which will be content with meager accommodations till better times come back, is this combination garage and home, Plan No. 3-G-52, built on back of lot.



In these plans for house No. 3-G-52 note that first floor forms garage space for two cars. Ample living room for family of three is provided on second floor. Note that access to the living quarters is gained by zig-zag stairs up side of house. For one sheet blueprint for this house or house No. 5-W-44 send $1.00 to Modern Mechanix and Inventions, Minneapolis, Minn.

Other forms are tucked in between studs and there's a kind that is blown on under pressure with a gun much like the spray gun method used for painting.

Rigid board form of insulation has become a popular interior finish. Applied directly to the studs in its natural color it forms a pleasing background for furniture and interior fittings. What's more, it can be painted, stained and given many interesting treatments. It therefore does double duty—it insulates and decorates.

Old Man Winter is right around the corner. It will soon be time to start furnace fires. The wise home owner can by a little extra effort and small expense insulate a roof and weatherstrip doors and windows. Even a 30 percent heat savings through a roof is a tidy cash savings at the end of the winter season.

House No. 5-W-44 Proving Popular

House No. 5-W-44 here illustrated is of the newer type coming into popularity. It cannot be named any special style. The steep roof pitch gives distinction and also provides considerable extra room above the first floor for sleeping quarters.

While the house may be called a story and one half type it offers complete bungalow service on the first floor, five good rooms and bath, and more space above for sleeping rooms if needed.

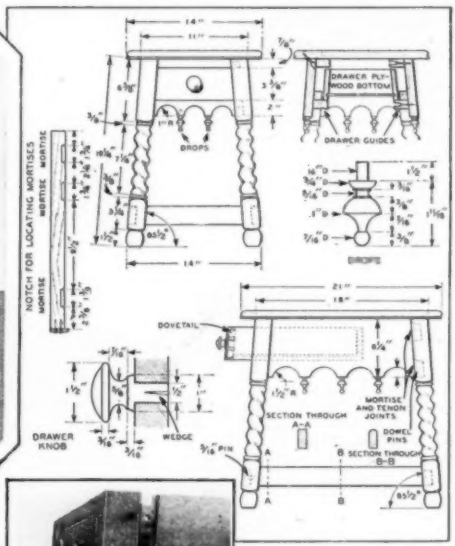
A 36 foot lot will be necessary, though a wider lot will be better. Frame construction, shingle side walls and shingle roof, a brick base course and brick chimney, complete the exterior finish.

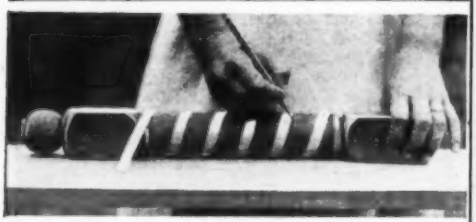
Inside the house are hardwood floors, a modern colorful bath, fireplace, efficient kitchen with built-in cupboards. Side walls

(Continued on page 148)

OLD Fashioned ENGLISH Joint STOOL

The completed joint stool, shown here, would be thoroughly at home back in Merrie Old England where it originated.





Lay out spirals on legs with strip of paper tacked at the ends as illustrated here. Mark along edge with pencil, then cut line to a depth of ⅜ in. using saw with plenty of set.

Follow these detailed drawings in constructing the table. Legs are made with piece of oak or walnut 1¼ in. square and 21 inches long, and are turned down in lathe to a cylinder with a ⅜ in. bead at each end. Right — Assembling the table. In finishing, if oak has been used, apply a coat of oil stain then wipe off with cloth and sand lightly with worn paper. Then with a swab of cloth apply one coat of flat varnish. Finally go over with a coat of wax rubbed to a slight gloss. Joints are held together with ⅜ in. dowels, driven in hole 1¼ in. deep and well glued. Notched stick determines position of the mortises.

THE original joint stool of which this is a modern adaptation comes from England where in early times it was used to support a huge roasted hind quarter of beef undergoing some hefty carving.

No great difficulties will be experienced in building this table, and it will make an attractive addition to your dining room. Almost any available kind of wood may be used, but oak or walnut is the most suitable. Making the legs will present the chief difficulty. The leg is placed in a lathe and turned to a 1¾ in. cylinder with a ⅜ in. bead at each end.

The spiral groove is laid out on the cylindrical section by means of a strip of heavy paper about ½ in. wide and long enough to make five complete turns around the wood. Make a pencil mark along one edge of the paper strip to represent the bottom of the spiral groove as illustrated in the photo above.

Now make a saw cut along this line to a depth of ⅜ in. The saw cut is then widened by the use of suitable tools, and when it has reached its final form it is smoothed with sandpaper. Two of the legs are made with the right hand twist and two with left hand twist, as the photo of completed table shows.

Next comes the framing. Mortise and tenon joints are held in place with 5/16 in. wooden pins throughout, conforming to the method used by early joiners. The notched stick shown in the drawing above will help you locate the mortises in the legs. The aprons and stretchers are brought to the outside edges of the legs, making a flush joint. All the tenons are made ⅜ in. thick.

When all parts have been fitted together, the stool is ready to be glued up. Glue the parts forming each side first and place in clamps till dry. When this has been done, bore the holes for the pegs, about 1¼ in. deep, dip the pins in glue, drive them in, then when dry, smooth up with sandpaper.

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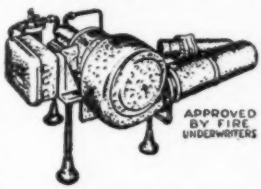

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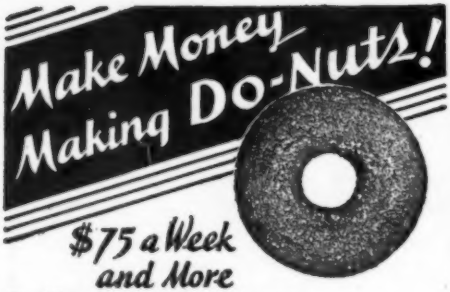

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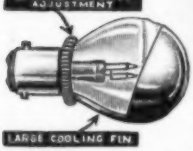
Makes FLOODLIGHTS of AUTO HEADLIGHTS



This amazing invention eliminates all the dangers of night driving. Lights both sides of the road, pierces fog, rain and snow and does not blind the eyes of the approaching motorists. FLOOD LITES can be installed in a jiffy by anyone. They fit all standard size bulbs and do not wear out. Exclusive cooling feature prevents burning out of bulbs. They are worth many times their retail price of only 75c per set to any motorist.

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To Get Money's Worth, Insulate

(Continued from page 145)

and ceilings and roof are insulated. There is a full basement.

House, lot and garage were priced at $6200 several years ago. But materials and equipment are at least 25 per cent less these days. Deducting the price of the lot the house and garage originally would run around $5000. Today the cost should be considerably less. It's a splendid plan. A stylish little place and well within the range of average pocketbooks, even in these depression days.

If you are content with minimum requirements in a house of your own and if you don't want to start a complete home building operation, even though small, until later, then the garage apartment, Plan 3-G-52, designed to be placed on the rear of a lot, should be of interest to you.

Many people are satisfied with just this type of equipment, which you'll find upon examination is nothing more than a miniature kitchenette apartment. Even so, in plan and service, it's as complete as many a larger house. There's a spacious living room in one end of which is a closet bed. This offers extra sleeping service in addition to the separate bedroom.

A small kitchenette with sink, cupboard space, counter, etc., opens off the hall. And next to it is a bath room. Three people can be accommodated in the little apartment. Below is storage for two cars.

The garage apartment is frame construction with shingle exterior finish and shingle roof, the least expensive construction. Blinds add notes of variety to the simple but pleasing lines of the house.

A heater may be placed in the first floor store room. This will be sufficient to keep the family warm.

What about cost? The designer says that an ambitious person, one who is willing to do some of the work himself, can probably build this apartment for around $2500, if not less.

Mechanical Ballot to Elect President

(Continued from page 62)

This method of securing election returns is in striking contrast with the dilatory procedure involved in ascertaining the true count under the obsolete paper ballots. Eager contestants, political factions, election officers and the press are particularly jubilant over the dispatch with which returns are made available by the machines.

The preservation of election returns is another paramount advantage afforded through the use of machines. The retention of the true count is especially valuable in the event of a recount or litigation. There are a number of safeguards em-

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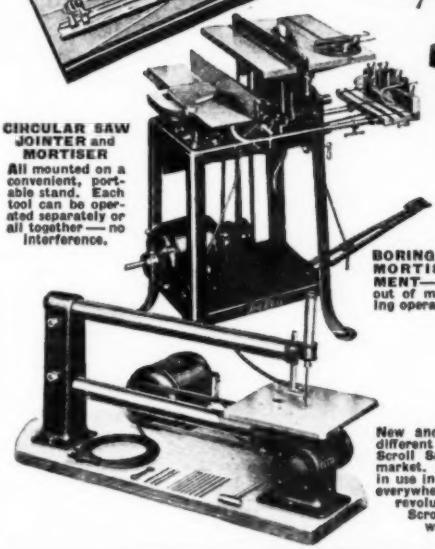

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bodied in the machine which makes it impossible to alter the returns, or perpetrate election irregularities that are attendant under the old system of balloting. The sanctity of the ballot is greatly appreciated by the American voters and governmental officials.

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32x4½	2.99	1.25	30x5.00	2.65	1.20
33x4½	2.98	1.25	28x5.25	2.65	1.25
34x4½	2.95	1.25	30x5.25	2.75	1.25
30x5	3.25	1.45	31x5.25	2.85	1.25
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Science Seeks Fortunes in Oil Wells

(Continued from page 86)

When an old well begins to die, it is sometimes brought to life again by "shooting it." A squib containing two to five quarts of nitroglycerine is dropped to the bottom of the hole and set off electrically. The explosion breaks up the paraffin-saturated rock and cleans out the old channels, allowing the oil to flow freely once more.

The ultimate content of oil sands, geologists say, can never be totally recovered except through actual mining. This is possible where surface outcroppings permit access to the oil formations. If the sand is brought to the surface and treated either by squeezing it mechanically or by boiling it in retorts and chemically treating it, almost all of the oil can be recovered. Sands pumped from oil wells and thoroughly drained in surface sumps, may yield from eleven to thirty-eight gallons of oil per ton. Sands freshly pumped from wells may yield as high as fifty-five gallons per ton. It has been estimated that from sumps and surface outcrops in California alone, 2,360,000 barrels might be recovered.

A strange reversal of ordinary production methods has recently been put into effect by engineers of the Union Oil Company of California, who pump oil back into the ground in order to increase the amount of oil they ultimately will recover.

High-gravity oil from flowing wells is stored in old low-gravity formations. The gasoline content of the new oil dissolves the heavy crude from the oil sands that previously would not yield up their treasure.

New Process Averts Gold Famine

(Continued from page 46)

resources with which to meet their domestic requirements should economic conditions justify.

Nickel is widely disseminated through the world's crust, and is generally associated in igneous rock with chromium and magnesium. The larger part of the commercial reserves of the world are in the nickel ore deposits of Ontario, Canada, and it is estimated that these reserves can supply the world's demands for many years.

For many years geologists and engineers have studied the scattered tin deposits of the United States, but attempts to exploit some of these deposits have invariably resulted in failure. Indications of tin of academic interest have been found in 16 states, but by far the larger part of the domestic production has been derived from Alaska. The Government geologists now, however, have found sufficient deposits in other parts of the world with which to supply tin requirements for many years, provided these reserves are exploited and used with care, every effort is made to stimulate substitution when economically possible, and recovery of secondary tin is carried on.

Commercial deposits of mercury have been found in California and Texas, and smaller occurrences in Nevada, Oregon, Idaho and Arizona. The United States, prior to 1911, was the largest producer of tungsten ores in the world, but production has decreased since then on account of economic exhaustion of the ores. The known reserves of ore within the United States are small in comparison with those of China and Burma.

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Ground Guns vs. Airplane Bombs

(Continued from page 98)

planes could swing around as indicated and still be within a blind area. As long as the planes stay within that zone they could not be fired upon.

The planes may also use tactics which will confuse or make inoperative the defense system. For instance, if the planes approach in mass formation from any one direction all three directors can locate and get bearings on them.

Suppose, however, that the planes come from three directions such as "N", "E" and "SW." In that case there will be three different sets of sound waves entering the detectors at the same time. It will then be extremely difficult for the detectors to sort out and locate the different formations.

Now suppose that the planes still come in from three different directions and at the same time come into the detector zone individually, each plane following the other at three minute intervals. If the plane schedule is so arranged that the planes from the three directions reach the bomb launching circle at one-minute intervals, there will be six planes within the sound detector zone at all times during the attack and at least three planes which can be heard by all three instruments.

Under such circumstances it will then be extremely difficult to have all three or even two detectors select the same plane to get bearings for the searchlights and guns.

There is no doubt but that the instruments and mechanisms for anti-aircraft defense have been greatly improved since the World War.

Mechanical Tricks for Hallowe'en

(Continued from page 92)

With a few appropriate words the pair can be told that now is the time to find out who will be boss in their household-to-be.

The prune is threaded to the center of an 8-foot string, then, at a signal, each person starts to "eat" his end of the string. The person first reaching the prune will, without a doubt, be master of the home. Fig. 3 shows this stunt being worked out.

When it is possible to have the guests pass through two or three rooms to some inner chamber, by all means insist that they follow the cord. This cord runs from one lighted room, through the dark rooms to the other lighted room. See that raw oysters are strung on this, 6 inches apart, as soon as the string is out of sight.

Before the evening is out, be sure to have someone sit on a round bottle with a needle. Have another person, of the opposite sex, sit on another close by with thread. The stunt is to thread the needle when in this position.

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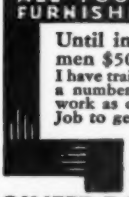

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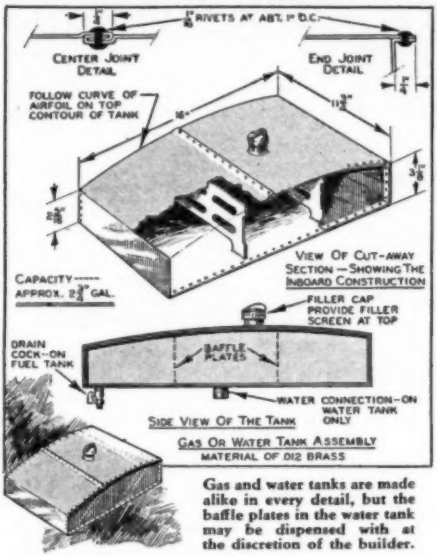
Plans for the Gere Sport Biplane

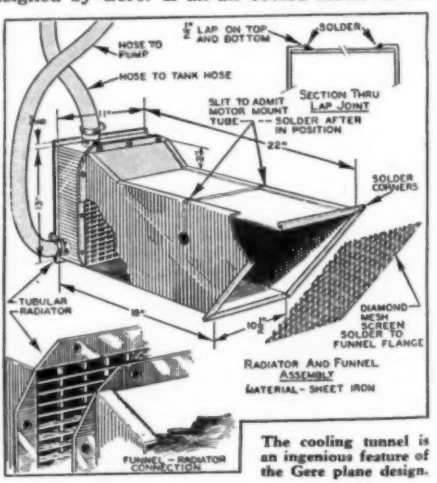
(Continued from page 117)


RIVETS AT ABT. 1" D.C.
CENTER JOINT DETAIL
END JOINT DETAIL
FOLLOW CURVE OF AIRFOIL ON TOP CONTOUR OF TANK
16"
11 3/4"
3 5/8"
2 3/8"
VIEW OF CUT-AWAY SECTION — SHOWING THE INBOARD CONSTRUCTION
CAPACITY ---- APPROX. 2 3/4 GAL.
FILLER CAP PROVIDE FILLER SCREEN AT TOP
DRAIN COCK—ON FUEL TANK
BAFFLE PLATES
WATER CONNECTION—ON WATER TANK ONLY
SIDE VIEW OF THE TANK
GAS OR WATER TANK ASSEMBLY
MATERIAL OF .012 BRASS

Gas and water tanks are made alike in every detail, but the baffle plates in the water tank may be dispensed with at the discretion of the builder.

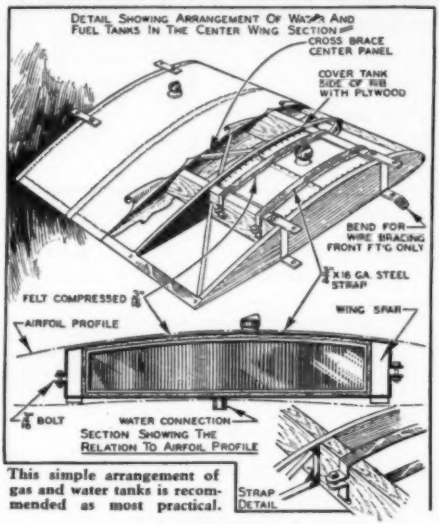
"A" or "T" or a Chevrolet motor is used the cowling will be substantially the same as shown in the drawings. As this part of the ship was rather hastily completed after Bud Gere's death we feel that there will be many who would prefer to work out the details of their own cowling. In any case, we do not advise changing the position of the radiator which is admirably located and by its unobtrusive position a help rather than a hindrance to the lines of the ship.

A sort of tunnel or air-lead ensures adequate cooling. Details of this tunnel are shown as well as the general hook-up of the cooling system as designed by Gere. If an air-cooled motor of the



The cooling tunnel is an ingenious feature of the Gere plane design.

Plans for the Gere Sport Biplane


DETAIL SHOWING ARRANGEMENT OF WATER AND FUEL TANKS IN THE CENTER WING SECTION
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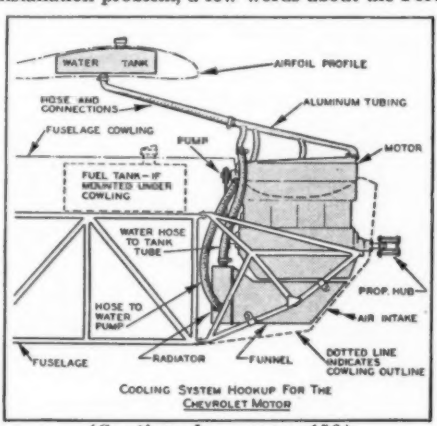
X16 GA. STEEL STRAP
FELT COMPRESSED
WING SPAR
AIRFOIL PROFILE
BOLT
WATER CONNECTION
SECTION SHOWING THE RELATION TO AIRFOIL PROFILE
STRAP DETAIL

This simple arrangement of gas and water tanks is recommended as most practical.

Szekely or Packmag Twin type is employed it will be necessary to check the weight and point of balance before making a motor mount to accommodate the engine. In any case, it will be advisable to check the point of balance **whatever motor is used,** before drilling the engine bearers and bolting the motor down. A good plan is to shift the motor back and forth along the bearers until the proper balance is obtained.

If a water cooled motor is used, a remote temperature gauge should be fitted and the motor always run up to about 150 degrees Fahrenheit before attempting a take-off. A Paragon 10 J 60 inch propeller is satisfactory for the Chevrolet motor. For Ford motors, use the propeller recommended by Mr. Pietenpol and for other motors obtain the manufacturers' advice on the subject.

For readers who are concerned with the motor installation problem, a few words about the Ford



COOLING SYSTEM HOOKUP FOR THE CHEVROLET MOTOR

(Continued on page 156)

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WATCH FOR NEW 1933 FLYING MANUAL

Plans for the Gere Sport Biplane

(Continued from page 155)

Closeup of center section at rear spar. Wing fitting is clearly shown. Note that lower section terminates without a lug, as no bracing wires are attached to center section at this point.

Model A power plant as applied to airplane use will be in order. That the engine is eminently fitted as a light plane unit has been adequately proved by the number of Pietenpol Air Camper monoplanes which have been built around it, there being upwards of two hundred of these ships completed or under construction at the present time. Mr. Pietenpol, pioneer with the Model A, has subjected the engine to every conceivable test and it has come through with colors flying.

Converting the Model A to airplane use is not a difficult task. Motors can be secured for around a hundred dollars. Modern Mechanix and Inventions has prepared a special blueprint on the Model A conversion which can be secured for one dollar by addressing the Blueprint Department of the magazine at 529 S. Seventh Street, Minneapolis, Minn.

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1929 FLYING MANUAL—Containing plans for Heath Super-Parasol Monoplane, Henderson powered, Russel-Henderson monoplane, Flying Lessons by Pilot Gene Shank, How to Design Your Own Airplane, etc. Price.....**$1.00**

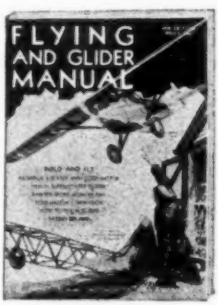
1930 FLYING MANUAL—Plans for the Heath Baby Bullet race plane, Alco Sport Plane, Lincoln Sport Biplane, Northrop Glider (the most popular type of primary glider), Light Plane Pontoons, Building Your Own Engines, etc. Price **$1.00**

1931 FLYING AND GLIDER MANUAL—Plans for M-M Secondary Glider (a closed cockpit design), the Longster Monoplane, the famous Driggs Dart, the Church Mid-Wing Monoplane, the Georgias Special, the Heath Seaplane-Parasol, etc. Price.....**50c**

1932 FLYING AND GLIDER MANUAL—Tells how to build the Pietenpol Air Camper monoplane, the most popular light plane for amateur construction ever designed (powered with Model A Ford motor), the Heath Super-Soarer Glider, the Ramsey Flying Bath Tub, the P. H. Racer, and many others. Price.....**50c**

1933 FLYING MANUAL, now in preparation, will include plans for the Pietenpol Sky Scout, single place monoplane with Model T Ford power plant, the Gere Sport Biplane, the Henderson Longster, Floats for Light Airplanes, etc. Price will be.....**50c**

NOTE: The 1933 Flying Manual will be ready for newsstand distribution during the month of November. Place your order with your news dealer *now* to be sure of having your copy when you want it. If he is unable to supply you, send 50 cents to Fawcett Publications, Inc., 529 S. Seventh Street, Minneapolis, Minn., and a copy will be mailed you as soon as it is off the press. The other manuals described above are carried in stock and will be shipped immediately upon receipt of order.



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Fortune Making Ideas for Inventors

(Continued from page 83)

2. *Chemical Treatment for Pipes*

Here is something for you fellows who like to play around with beakers and test tubes.

Raw, blistering smokes come from new pipes because of the presence of much of the natural oil in the wood. Is there no way in which this could be eliminated? I would say that heat, perhaps boiling, would have to be done. What I visualize is a mixture that would be sold in the five and dime stores in which a man could boil his pipe and rid it of this torture. Perhaps it could be put up in powder form.

Specifications: Either a complicated process that could be licensed out for the use of pipe manufacturers or else the material, either powder or liquid, that could be sold for home use. The cost should be kept low.

Exploitation: Again I say, if the inventor could afford it he should patent this process in all of the leading countries. The idea should be worth $100,000.

3. *Creeping Sprinkler for the Lawn*

The lawn sprinkler that has moving parts operated by water pressure has long since been a very common article of commerce. This, as clever as it is, is only carrying a good idea half way. Why not a water-powered sprinkler that will be made to creep along the lawn; that is, made to move itself slowly in a large circle?

This should not be such a great problem at that; nothing beyond the intelligence or good mechanical sense of my average reader.

Specifications: Should not cost any more than fifty per cent more than present sprinklers. Should consume no more water than the sprinklers now used. An automatic device should operate to stop the rotating mechanism after one great circle had been described. This would prevent the hose from kinking.

Exploitation: Should be patented in the United States only.

4. *A New Type of Key Holder*

Did you ever fumble in the dark trying to find the right key to the door? Most keys bear great physical similarity and it is most difficult to locate the right one. Why not a key holder that would permit you to press a button—and out pops the right key?

For the life of me I cannot see any great mechanical problem standing in the way of such a development. Some sort of a little box-like arrangement with slots for the keys and little spring releases controlled by tiny buttons would do the trick. If this thing could be made small enough and cheap enough I can sense a market running into millions for it.

Specifications: Should be small and light in weight. A man would not want a pocket in his Sunday suit to appear as though he were carrying an apple in it all of the time. Naturally there should be no complicated mechanism; nothing to stick or jam. The price, too, should be kept within a dollar.

Exploitation: If the inventor can possibly afford

it, this thing should be patented in all of the leading countries of the world.

5. *Cheap Insulated Container*

Those inventors who are keeping up with the times know how popular the use of dry ice has become in dispensing foods that have been exposed to quick freezing. It has also been applied to ice cream. The need for a container that will preserve dry ice over a longer period of time is urgently needed and when I say urgently needed I mean just that.

The container, naturally, must be made of some common material that can be formed into a container that is to be given away. The problem may be solved by a new insulating material that will preserve the dry ice or the frozen food over a longer period. At any rate here is a neat problem that means money and plenty of it for the man who wants to apply himself to the task.

Specifications: Cheapness is the great consideration, although I am free to say that this container may cost a little more than the containers at present used for this purpose. This container should add at least fifty per cent to the time that food may be kept cold and dry ice kept in the solid form. The material from which it is made may be anything as long as it is cheap, clean and workable.

Exploitation: Should be patented in the United States only. Worth $100,000.

6. *Leak-proof Automobile Radiators*

I no more than mention the words than we all recall sad experiences with these things—leaks, leaks and more leaks. I have decided that everything on an automobile has been improved but the radiator. The only thing that radiator manufacturers have done really is to improve the method of manufacturing these things.

The idea of using solder in the construction of things of this kind is not mechanical; it violates every decent principle of construction. First off, we all know that when water strikes two dissimilar metals, like solder and brass or copper, "local action," due to the presence of small electric currents, is set up and corrosion begins eating the joints away.

There is a better way of making radiators or at least a better and more scientific way in which water may be cooled rapidly. Let's find it and let's get a million dollars for it!

Specifications: Should be either a new method of making radiators without the use of solder or a new method of cooling water. The cost should not run any higher than that of the radiators now in use.

Exploitation: Should be patented in all of the leading countries of the world.

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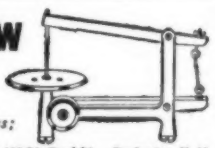

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How Buck Filmed Jungle Battles

(Continued from page 39)

Mr. Robillard installed sound-recording equipment in the Bronx Zoo in New York City and there he captured the necessary roars, grunts, sighs and gasps, and later got these to synchronize with the emotions of the "actors" in the picture. Some of the sounds were also made by the human voice, and mechanical gadgets were used for still other noises.

What has baffled most critics is the unfathomable number of "breaks and coincidences" which Nick Cavaliere and Carl Berger, the expert and versatile camera operators, encountered in the wilds of Siam and Sumatra.

It must be conceded that Clyde E. Elliott, the Hollywood-bred director, also got some marvelous breaks in getting jungle troupers to "emote" properly at the right time and place.

"It was eight months of patient work," Nick Cavaliere told me. "The whole undertaking cost about $100,000. We had six cameras and 36 miles of film, and over 400 flares for night photography.

"The rest of our photographic equipment consisted of four complete sets of developing apparatus, extra lenses for all cameras and 500 flash bulbs."

Cavaliere and Berger made an exhaustive study of the region and they succeeded in learning of the experiences of amateur photographers who had been in that section before them.

"That was the first time I was ever in the jungle," said Nick Cavaliere, "and I found plenty to learn about photography in that zone. I hope that we brought back knowledge which will be of assistance to science in future work of a similar nature.

"I was told that I would have great difficulty in getting good quality in my photography after three o'clock in the afternoon. I found that point to be accurate. I was told too that I must not consider 'shooting' anything between twelve o'clock noon and half past one.

"However, with my own ideas on this matter, I tried several exposures at the forbidden time, and the results were excellent. It became my suspicion that other cameramen had no desire to work in the intense heat of the tropical mid-day sun.

"One of the best sequences, the fight between the crocodile and a tiger, was filmed at the proscribed time. The scenes are clear and, as we say, 'full of great definition.'

"It would seem that in a tropical area, with the sun beating down fiercely, that the problem of sunlight would be non-existent. Unfortunately, the equatorial sun rays have a definite yellowish cast, and require plenty of exposure. The actinic value of light is definitely weaker, I have found, because a ray that beats down directly on the earth 'bounds back.'

"In our photographic operations we worked mostly from behind blinds which were erected whenever possible against the wind in order to prevent our scent from reaching the animals.

"When we arrived at the first bazaar, or 'country store,' one of which is shown in the picture, Mr. Buck was told by one of the Sakai natives

How Buck Filmed Jungle Battles

that he had seen a thirty-foot python so many 'spits' away. Mr. Buck promised the native one Straits dollar, less than fifty cents American money, and a half pound of salt if he would direct us to the spot where he had seen the serpent.

"The native then explained that the python had devoured an animal and would most likely be in the same place for several days. They then decided to make a clearing somewhere in the vicinity of the python's resting-place.

"This clearing, which could only be large enough for the party's quarters, equipment cabin and animal cages, was finished in two days. Incidentally, it obviously was not large enough for any such struggles as those in which the python and the tiger later indulged; nor were the members of the party such bad campers that they would build their compound on a site so low that there would be crocodiles lying around in mudholes.

"This is as good an answer as any to the suspicion that the fights were 'staged' in the compound.

"During the two days necessary in making the clearing a watch was kept over the comatose snake. It was several days after the clearing was made that the python came to and began to take notice. Mr. Berger and myself had been instructed in the ways of pythons. It is possible to walk in front of a python, but to touch one is to throw one's self into the flashing coils from which the only release is death.

"I was taking a picture of the python, and my only defense was the tripod and the boxes under it which contained the batteries and the box which contained the electric motor, which made a slight whirring noise.

"It was the noise of the motors that got him. He was lying there sunning himself, stretched out almost full length, and about twenty feet from me. Suddenly he began to move towards the camera.

"I stood it as long as I could, grinding away to beat the devil, and then I sprang aside. Well, imagine my surprise when the snake didn't even pay any attention to me. I stood behind a tree with the others and we watched that python. He couldn't understand the noise of the motor, but he guessed it came from the film boxes under the tripod, so he began to coil himself around the metal box.

"We watched him coil himself slowly around the boxes, and he was a long time getting to the squeezing point. A couple of good squeezes and we figured our equipment would be shot to pieces and the chances would have been that we would have to come back with only disappointment as our cargo.

"I can tell you that we got pretty anxious and excited about what that python was up to. Finally I got hold of a long stick and reached over and kicked off the motor switch. The motor stopped. The python noticed the difference and pretty soon he let go, unraveled himself, and slid away."

After that one experience with a python Nick Cavaliere became a python expert and before their trek was over he had encounterd a half dozen of them, none of which gave him any worry.

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